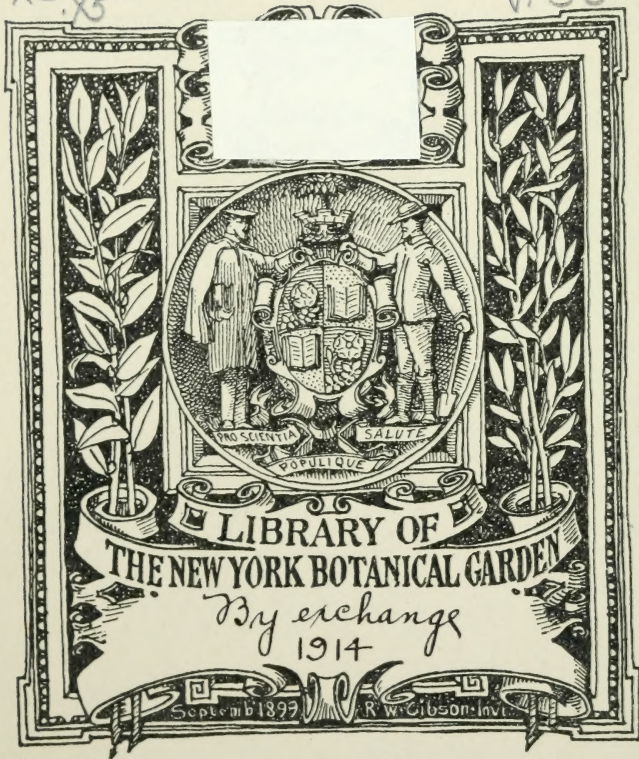
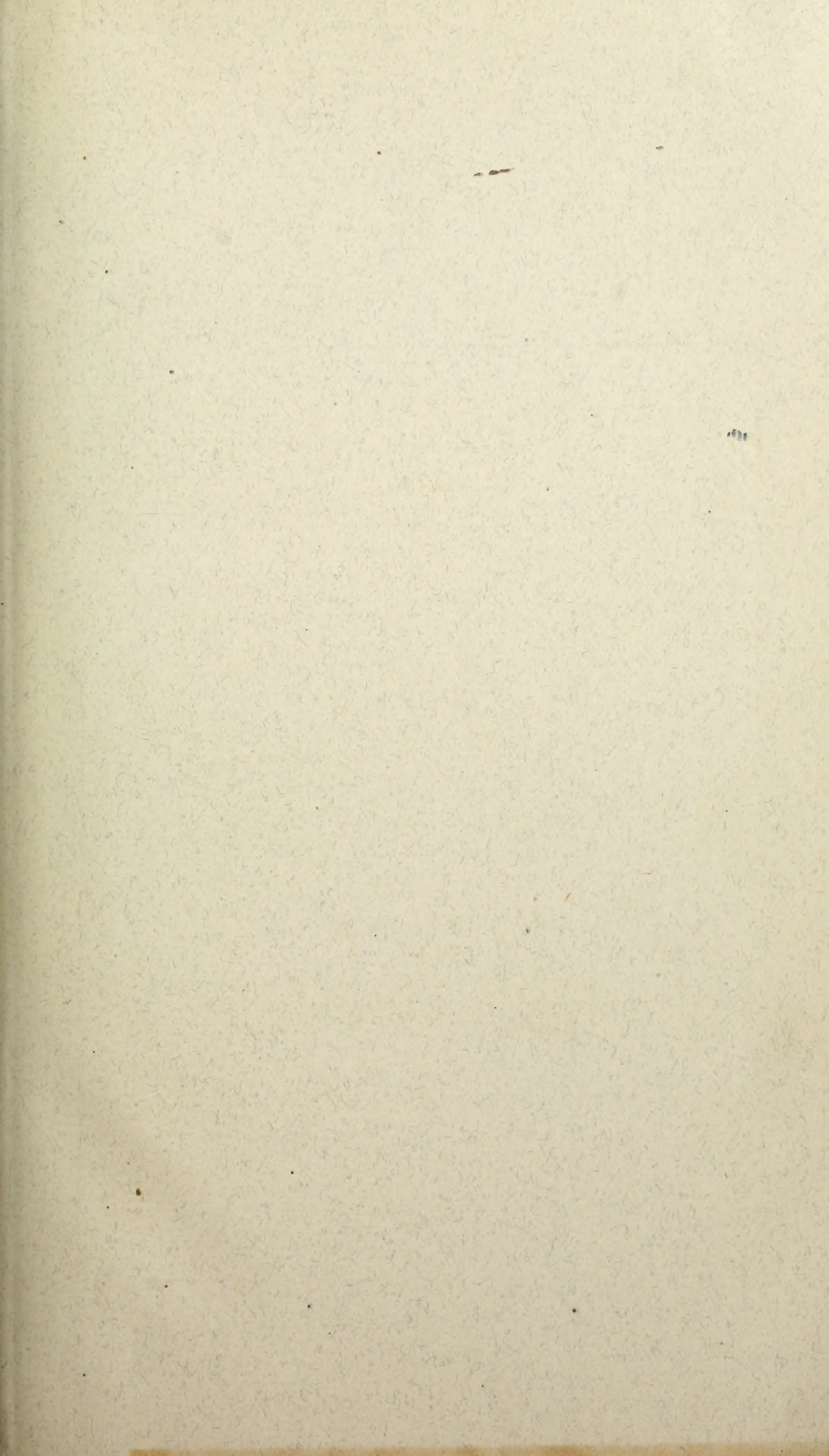


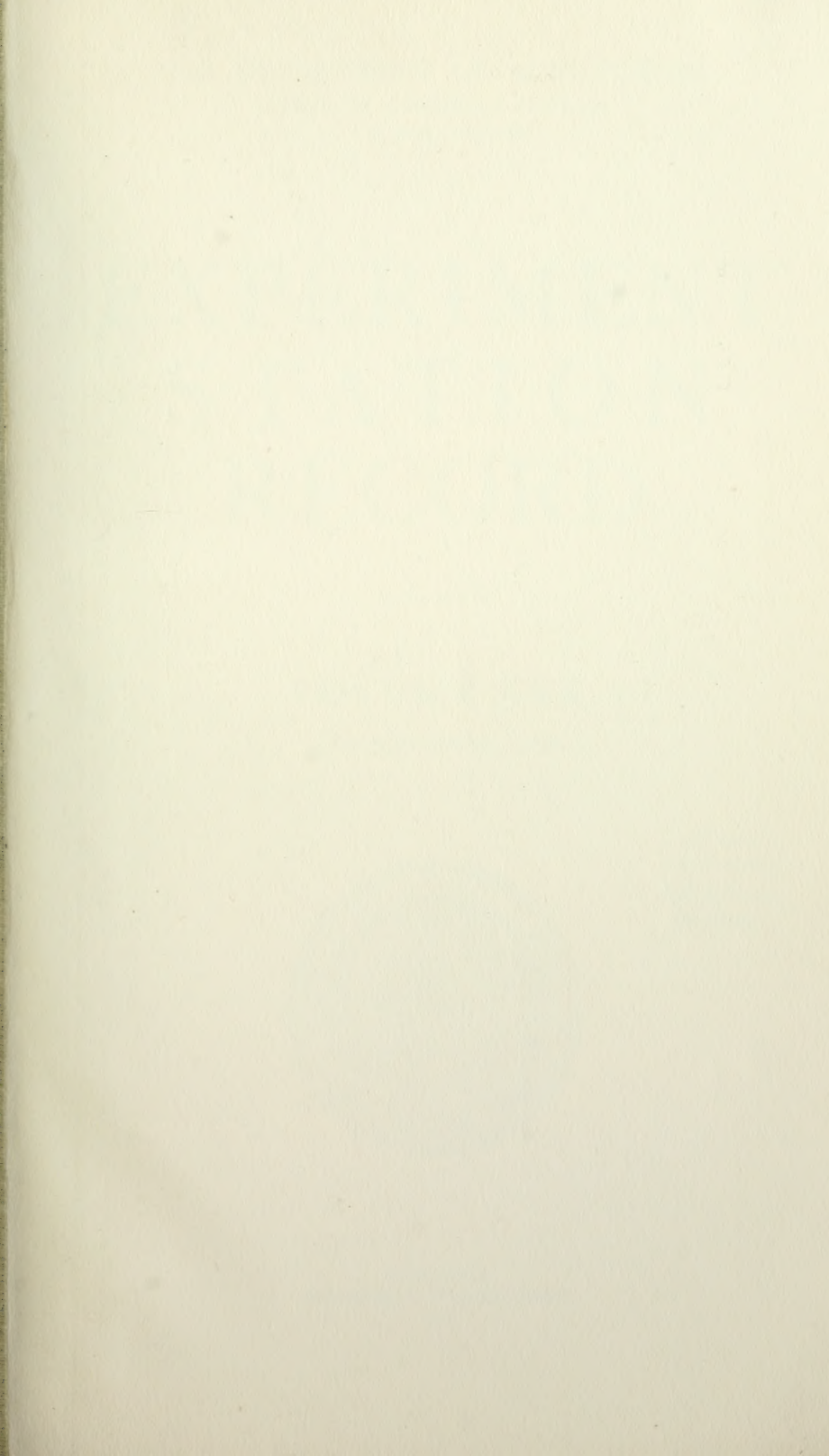


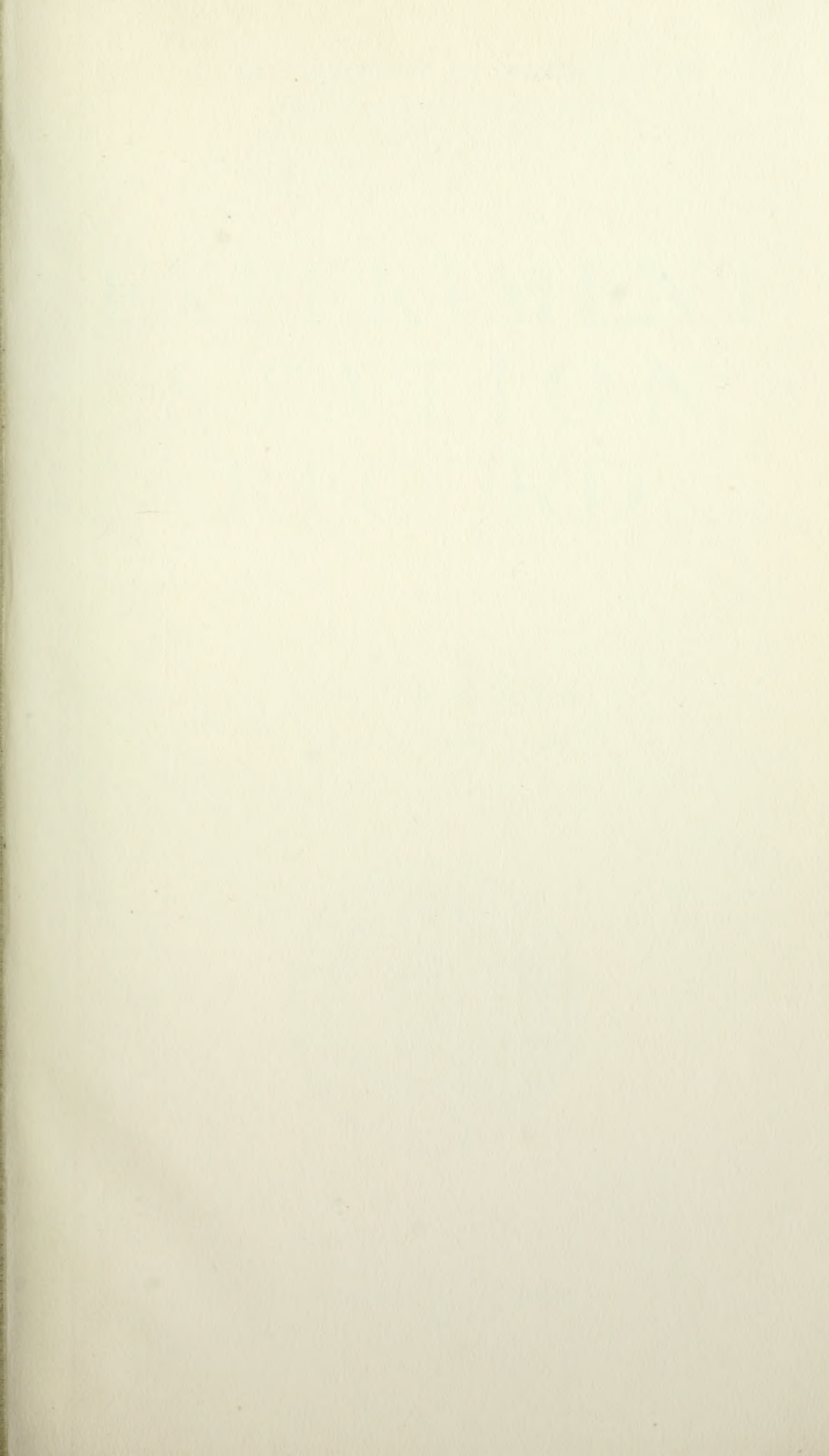
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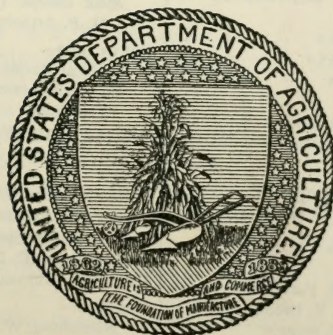


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EXPERIMENT STATION RECORD

VOLUME XXX

JANUARY-JUNE, 1914



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VOL. XXX.

JANUARY, 1914.

No. 1.

Not to know something of the history of one's specialty is to miss much of the intimate and sympathetic feeling toward it which comes through acquaintance. Not to know the toilsome and often disheartening path along which the science of agriculture traveled in its early days in this country is to lack, not only an intelligent appreciation of what has actually been accomplished in a half century, but an insight into the manner in which it came about. It is to miss much of the broader interest of the subject, and much of the pride and satisfaction in its pursuit.

For the young man especially such an insight is a part of education and preparation for this field. It helps to give a proper attitude and sense of proportion, as well as enable just estimates. It is not necessary to live in the past to enjoy familiarity with it or to trace the unfolding and development of a new idea; and the man who devotes some attention to it is in no sense pursuing a dead subject. While he is broadening his sympathies and acquaintanceship he is strengthening his own grasp and conception. Not infrequently the lack of originality is disclosed of some things cherished as new, and again the relatively small advancement which has been made in some lines is brought forcibly home.

The lives of the leading pioneers in this field contain much that is of interest and worthy of knowing. To know them and their environment more intimately increases respect for what they did and for the ideals they stood for and strove to propagate. Naturally they did not fully attain to these ideals, else their work and influence would not have been so potent and we would not be where we now are, for the man who overtakes his ideals ceases to be a factor in progress. Ignorance is prone to judge these early workers unfairly by what they did not do, and to underestimate the true nature of their service, because it overlooks the hindrances that stood in their path, and has no intelligent realization of the determination, the self-supplied encouragement, and the personal effort which their work represents. It is knowledge of the environment that enables a true perspective.

The history of the movement which has brought science to the aid of agriculture has not been written, and its records are fragmentary and disconnected. Hence each effort in that direction is a welcome contribution.

The letters and papers of the late Dr. Samuel W. Johnson, for many years director of the Connecticut State Station, have recently been brought together and published by his daughter, in a volume of much historic interest. The preservation and publication of this material is a matter for congratulation, and its editor has placed her readers under many obligations for the interesting and highly instructive volume she has produced. It pertains to a period whose participants are rapidly passing and mostly gone.

The book is at once a biography of a man and a history of a movement. As a biography it is most satisfactory and entertaining, the remarkable extent to which Dr. Johnson's private and official correspondence was preserved giving an intimate view of the man and his work rarely possible. The interpolations and explanatory matter supplied by the editor serve to make the volume in a large degree a connected and faithful record of the progress of events in bringing science to the benefit and protection of the farmer.

The letters cover the period from 1848, when the interest of the schoolboy in agricultural matters and in chemistry were crystallizing and his aspirations being put on paper, to near the close of his life. They include correspondence with his intimate friend Dr. F. H. Storer of Bussey Institution, with Dr. Evan Pugh, a fellow student at Leipsic, who afterwards went to the new Pennsylvania State College, with Mr. Luther Tucker of Albany, editor of the *Country Gentleman*, who lent much encouragement to Dr. Johnson's ambitions, Dr. G. C. Caldwell of Cornell, Dr. E. W. Hilgard of California, Dr. George H. Cook of New Jersey, Dr. Peter Collier, later of the Geneva Station, Dr. Charles W. Eliot of Harvard, President W. S. Clark of Massachusetts, Sir John Lawes, Julius von Liebig, and many other notable persons.

These letters present a striking illustration of the slowness with which the idea that science has a vital and practical value to agriculture took hold in this country, and show how difficult it was to secure encouragement or support for a career in that field a half century ago. After he had determined to enter it Mr. Johnson went to Yale in 1850 and again in 1852, teaching in the meantime to acquire funds, and spent the years from 1853 to 1855 in advanced study abroad. During this time he attracted attention to himself by his writings on agricultural matters, in which he strongly presented by word and illustration the benefits to be derived from agricultural investigation and the desirability of public provision for it. Mr. Tucker was anxious to

see a place made for him in New York, and there was correspondence about positions elsewhere, but no opening presented itself on his return and he was obliged to accept a teaching position at the new Yale Scientific School, affording no direct agricultural connection. He considered the plan of opening an agricultural school, and at one time corresponded with Pugh with reference to associating him with the project, as opportunities for developing agricultural work did not materialize.

In 1855 the New York State Agricultural Society, largely through Mr. Tucker, proposed to fit up a laboratory and invited him to become its chemist. It was explained, however, that the office carried no remuneration excepting the fees for agricultural analyses, etc., which with writing for the press it was suggested "might yield a living compensation." This society was probably the first to take such an advanced step, but the outlook was not sufficiently encouraging and Dr. Johnson temporarily rejected it. Later he made an effort through the society to secure an endowment for an experiment station in that State, but this failed of support, as did the movement for an agricultural college in New York in which he hoped to have a part.

It is interesting to note in this connection that Liebig, under whom Dr. Johnson had studied in Munich, strongly considered coming to this country if he could receive suitable encouragement. A correspondent wrote in 1856: "He has almost made up his mind to go to the United States and set up a model farm and agricultural school, provided one of the States will furnish him with the lands and funds."

Meanwhile, although much occupied with his duties as instructor in chemistry at Yale, Dr. Johnson found time for some agricultural analysis and wrote a series of articles for an agricultural paper which served to introduce him to the State Agricultural Society, and resulted in his being appointed chemist to the society in 1856. This gave him an affiliation and a constituency, but quite limited opportunity. It was not until twenty years later that he realized the dream of his youth, and as the head of the sole American experiment station was able to center his efforts on agricultural work.

All through the writings of these earlier years we get glimpses of a longing for the opportunity to give himself largely to agricultural research. "It is a source of deep and continual regret," he writes, that his efforts in the field of agriculture "have been mostly confined to editing and communicating the results of the labors of others." In the preface to his book on *How Crops Grow*, in 1870, he offered an apology "for being a middleman and not a producer of the priceless commodities of science," which position he attributed to lack of opportunity.

Fertilizer inspection and fertilizer control naturally figured conspicuously in the early agricultural work. The use of fertilizers was rapidly coming into practice in the early fifties. They were not always intelligently made, for not very much was known of values, and the claims put forth for them were often exorbitant as well as their cost. Here many farmers felt a real need for assistance.

Dr. Johnson began discussing these matters in the agricultural press in 1853, while yet a student at Yale. He iterated and reiterated the necessity of chemical analysis as the only basis for judging of the composition of a fertilizer, the reliability of accurate analyses as a guide to values, and the importance to the community of a regular system of analysis of all commercial fertilizers as a safeguard against fraud as well as against the self-deception of ignorance. In 1856 he introduced the method of calculating the "valuation" per ton on the basis of the commercial values of the constituents, in the principle of which he was a strong believer.

His systematic inspection of fertilizers dated from his appointment as chemist to the State Board of Agriculture in 1856. In his first report he said: "It is vastly pleasanter to suppose that frauds are mistakes rather than willful attempts to cheat; but it is of the utmost importance to know whether we are liable to be intentionally as well as accidentally imposed upon." The condition of the trade at that time is illustrated by the statement in this first report that "of all the superphosphates I analyzed last year not one came up to a reasonable standard of quality," and "of all the other high-priced manufactured manures which have been twice analyzed not one has maintained a uniform composition."

It is difficult at the present time to realize the novelty of the undertaking. The rights of business men to make and sell what they chose in any line was undisputed, and the public was without protection except at individual expense. The principles he announced were new to business generally, and as applied to fertilizers they were largely new to many of the manufacturers as they were to the public. They subjected him to criticism and misrepresentation on the one hand, and brought him encouragement and support on the other. In 1869 Dr. George H. Cook, of New Jersey, wrote him: "The circulation of such reports as that of yours on fertilizers will be of great use, and I hope you will be allowed to continue making full and fearless reports on the worthless manures which are so common in the market." Many others, including practical farmers, expressed their appreciation and hope that he would not be stifled in his efforts. Fortunately he was able to maintain his position. His work brought inquiries from all parts of the country.

Very naturally from the interest surrounding this subject, the agitation for experiment stations, and especially the first station in Con-

necticut, was bound up with the history of fertilizer inspection. It furnished a stimulus, and in some instances overshadowed all other purposes of such an institution. One of the men most instrumental in securing the new station is quoted as intimating that "the purpose of this station was for the analysis of commercial fertilizers alone;" and the sentiment is further shown by the resolutions of a farmers' club, which stated substantially that they would patronize no manufacturer or dealer who was not willing to put his wares under the control of such an institution.

These views were not in accord with Dr. Johnson's ideas as to the full function of an experiment station or the methods of exercising a fertilizer control. He opposed any attempt on the part of the station to formally control the output of manufacturers or storehouses, but held the most effectual plan to be the taking of samples of the goods as offered for sale, and making the analyses public. This will be recognized as the form which ultimately prevailed and has been generally adopted.

It is interesting to read, at this period, of systematic work among farmers akin to some of the present features of extension work. In 1859 Dr. Johnson wrote, "I am on a month's tour among the farmers of Connecticut and expect to speak every evening of the week except Saturday and Sunday." In the following year he took prominent part in a course of agricultural lectures at New Haven, arranged by Prof. J. A. Porter, which fully five hundred persons came to New Haven to attend,—a forerunner of the short courses. He wrote many popular articles for the agricultural press, and through the columns of a leading New York daily he reached a wide audience in the early seventies, his articles and discussions of agricultural matters attracting attention from the first.

The high character of Dr. Johnson's scientific ideals and standards, and his advanced conceptions of the kind of work of most permanent value to agriculture, as shown by his earlier writings, are especially worthy of note. Although these could not be fully carried out, on account of conditions of the times, they were in evidence notwithstanding, and they served to give him a recognized leadership in agricultural thought. The passage of years brings out more clearly the advanced position which he occupied. His writings of sixty years ago are interesting reading and entirely applicable to-day. Their obscure publication has hidden them. The pity is that we haven't long ago had the benefit of the light they shed.

Early in his career, before he had entered college, in a contribution to an agricultural paper he made a plea for "reason and labor without prejudice" in scientific work: "It becomes," he said, "the interest as well as the duty of him who would bring science to the aid of agriculture to make every labor as complete as possible, and especially

to avoid the dogmatic introduction or support of untested theories, and the narrow-minded ignorance which entertains the possibility of making any one discovery which shall remedy the failings of the present practice,"—good advice for the present day, and still needed.

In an article in the *Country Gentleman* in 1854, he declared that "what agriculture most needs is the establishment of its doctrines—not the proposition of fancies, or of facts which hold good for this or that township, but the evolution of a general theory applicable everywhere. . . . The basis of doctrine will not rapidly unfold itself. It must be unfolded. If agriculturists would know, they must inquire. The knowledge they need belongs not to revelation but to science, and it must be sought for as the philosopher seeks other scientific truth." Some of this sounds quite modern. As he well realized, the method and essentials of agricultural investigation are only different in kind and not in nature from those in other branches of inquiry. We have had to learn this, and the expensive lesson that short cuts are disappointing. Much of the purely local testing and experimenting is now recognized as extension instead of investigation.

In 1856 Dr. Johnson delivered a lecture before the New York State Agricultural Society, on *The Relations Which Exist Between Science and Agriculture*. This is a truly remarkable address, which deserves to be preserved but had been largely lost to the present generation until brought to light by the publication of this volume. It foreshadowed the spirit as well as the method and the position of the agricultural experiment station.

In this address he explained why up to that time agriculture had not profited from the applications of science to the same extent that the manufacturing arts had. Aside from the inherent difficulty of the subject, one reason was "the lamentable circumstance that our agriculture is so barren of facts—I mean that kind of facts which only can form the foundation of science; I mean complete facts. . . . The first thing to be done is to multiply facts." And he outlined the way in which these scientific facts were to be acquired, in a manner so sound and clear that they are worth quoting at this time.

The establishment of facts, he explained, "is accomplished by observation and experiment. Ordinary observation takes cognizance of what transpires in the usual course of nature. Experiment is that refined instrument of modern research which interferes with the ordinary course of nature, and compels her to unusual manifestations." But experiment requires skill and direction, and keenness of perception. The great secret, as he said, is to know where to look. "The empiric experiments at a venture, without any probability to guide him. His haphazard trials often reveal new facts, but he rarely contributes largely to scientific progress because he makes haphazard experiments, because he does not reason.

"The philosopher experiments with an object in view, and distinctly in view. . . . He first collects and collates all the facts known with regard to it. He then seeks to construct a consistent explanation of these various facts. It may be that he finds it impossible to do this. Then he must verify the facts; perhaps some are false or he sees them from an insufficient point of view, or he must collect more of them by extending his observations, it may be by experiment. He shortly is enabled to form a hypothesis, to frame a theory which promises to account for the facts. Yet it is not a hypothesis but truth he seeks, and now he begins to test his theory. Every deduction which he can draw from it must prove true, else the theory is false. He therefore unites the conditions which his theory indicates will produce a given prevised result. If the result follow, his theory is confirmed, otherwise it must be rejected and a new one formed and similarly proved. Here is where experiment assumes its chief dignity and value. Here it must be suggested by reason or it can not be expected to answer any good purpose. Here if rationally devised and skillfully executed it must reveal a truth, and though the truth be negative it is not the less valuable, for every new negative result limits within narrower bounds the space wherein positive truth is to be sought."

This description leaves little to be added. It shows how deep was his insight into the method of science and how thorough his preparation for investigation in it some twenty years before the first station was achieved.

As to the requirements of experimental work in order to make it of value, Dr. Johnson mentions that at that time (1856) several experimental farms had been established in the country, but states the results of their experiments had no general or permanent worth, for "they have not been made with more insight, nor have they been calculated to clear up more doubts, than the single experiments carried out here and there by private individuals." Although executed with more care, "this has been so much more labor lost," for "the large share of the problems that are now needing solution require the laboratory and farm to unite their resources. . . . As mere practice is deficient in all that belongs to the province of science to suggest, so science alone lacks that which practice is naturally fitted to supply; each is the complement of the other; rational agriculture is the result of their union." He described the European experiment stations as "intended to make science practical and practice scientific."

The essentials and distinctions here outlined so clearly had to be learned by the American stations at heavy cost after the system was established more than thirty years later.

In a later article Dr. Johnson gave this rule for testing theories: "The best method of attaining truth is to endeavor earnestly but hon-

estly to disprove what appears to be true. . . . The only way to be certain you have got at the truth is to go counter to the current of self-complacency. If you can sit down deliberately with your supposed facts and with your theories, and try by every imaginable test to find where they do not harmonize or where they do not satisfy strict logic, then and not until then can you be pretty certain that you stand fair and square on that subject." And he adds that it is not the novelty or the glory of discovery, but the genuineness of discovery, that is of first importance!

But although Dr. Johnson had these high standards for agricultural investigation and realized the great need for work of such permanent character, he did not let this stand in the way of his usefulness. He was wise enough and zealous enough to patiently set his hand to what he could secure interest and support for, and hence in the early days much of his work was the routine analysis of fertilizers and other materials—work which needed to be done at that period and which served to develop confidence and support for other lines and for larger undertakings.

An interesting sidelight on the times and showing his genuine concern for the farmers' welfare is his caution to them, as early as 1854, against too blind confidence in all that was recommended in the name of science. "Let him beware of false lights which are nowadays hanging out in abundance; let him beware of taking advice from two dangerous characters—the conceited farmer who knows a little science, and the officious philosopher who knows a little farming." Combating the popular notion of the great value of soil analysis as a guide to the farmer, he sums up the case thus: "Soil analysis at best is a chance game; and where one wins a hundred may lose. A soil analysis is always interesting, often valuable, rarely economical."

A little later he admonished the farmers of his State to beware of setting experience in opposition to scientific truth, and in order that what he wrote might be read he headed the article "American Guano." Contrasting experience and science he declared with emphasis that there is no antagonism between the two except in error, experience being "many times unsuspecting, blind, or prejudiced." "Science is but another and the true name for all that is good in the experience of all men. . . . Common experience is the native rank but wild growth of knowledge. Science is its trained and cultivated development."

At the present day agricultural education is emphasizing these truths, and is making common experience more reliable, because more enlightened and less "unsuspecting, blind or prejudiced."

A recent writer has said that unless the student or investigator of scientific problems has in his conception some infusion of the divine

fire, his work never rises above the humdrum and the commonplace. "He *must* at times feel his heart burn within him as he walks the ways of his chosen calling." No one can read the letters and the papers of Dr. Johnson without realizing that he had the infusion of divine fire, and that many times his heart must have burned within him with zeal for his chosen subject.

But it took a man of more than enthusiasm to write as he did of the future of the agricultural experiment station and its far-reaching influence. It required vision and conviction to labor patiently for its coming, and to contend that the discovery of the new would vitalize the old in agriculture, would broaden the intellectual life of the farmer, replace mechanical actions and prejudice with reason, and bring the farmers and the agricultural colleges closer together—prophesies which he lived to see fulfilled.

It would be a careless reader who did not gain from these writings a clearer insight, a higher purpose, and an enthusiasm for a kind of work that shall endure. They carry an inspiration and a stimulus for the rising investigator, not only to continue the work of agricultural investigation, but to make the most of the larger opportunity to attain the ideals which he propagated at that early period.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

Principles of agricultural chemistry, G. S. FRAPS (*Easton, Pa., and London, 1913, pp. 493, figs. 94*).—This book is adapted for the uses of the student and those wishing an introduction to the field of agricultural chemistry, as well as for a reference book. It is plentifully illustrated with reproductions of photographs taken chiefly from experiment station literature and that of the United States Department of Agriculture. Considerable attention is given to the chemistry relating to problems of both plant and animal physiology.

The chapter headings are as follows: Essentials of plant life; the plant and the atmosphere; origin of soils; physical composition and classes of soils; physical properties of soils; the soil and water; chemical constituents of the soil; chemical composition of the soil; active plant food and water-soluble constituents of the soil; chemical changes; soil deficiencies; losses and gains by the soil; manure; sources and composition of fertilizers; purchase and use of fertilizers; constituents of plants; composition of plants and feeds; digestion; utilization of food; maintenance ration and fattening; feeding work animals and growing animals; feeding milk cows; and feeding standards and feeding.

About the pentosans, S. GOY (*Fühling's Landw. Ztg.*, 61 (1912), No. 18, pp. 606-612).—A discussion in regard to the chemistry and biology of pentosans and their occurrence in nature.

The temperature at which starch granules gelatinize, M. NYMAN (*Ztschr. Untersuch. Nahr. u. Genussmtl.*, 24 (1912), No. 11, pp. 673-676, figs. 8).—The temperature at which starch does not affect polarized light is looked upon as the gelatinization point. For rye starch it was found to be 57° C., for barley starch 58°, and for wheat starch 59°.

The chemistry of wood.—The resins of the Douglas fir, G. B. FRANKFORTER and H. H. BROWN (*Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York]*, 25 (1912), Sects. I-Ve, p. 359).—An acid which the authors chose to call betic acid was isolated from the resin obtained from the wood of the Douglas fir. When it was recrystallized from 62 per cent alcohol, it appeared as well-formed crystals with a melting point of from 143.5 to 144.5° C. The figures obtained on elementary analysis pointed to the formula $C_{17}H_{24}O_2$, which was verified by the analyses of its salts and by its neutral equivalent. "Molecular weight determinations by the freezing point method, however, gave numbers nearly twice too high for the above formula, doubtless a result of polymerization. In addition to the preparation of the metallic salts, bromin and iodine compounds were made and studied." The molecular constitution is regarded as still undecided.

The investigation of the chemical action of bacteria, A. HARDEN (*Chem. World*, 1 (1912), No. 12, pp. 403, 404).—A review of work by various investigators as to the bacteria which are hygienically and industrially important. The changes brought about by bacteria are regarded as principally due to the enzymes which they contain or elaborate.

Progress made in regard to the fermentation organisms and enzymes, A. KOCH (*Jahresber. Gärungs-Organ.*, 20 (1909), pp. VIII+659).—This is a retrospect of the work published during 1909, including text-books, etc., (pp. 1-17); methods and apparatus (pp. 18-47); morphology of yeasts and bacteria (pp. 48-84); general physiology of bacteria (pp. 85-188); special kinds of fermentations such as alcoholic, lactic acid, and those in cheese and milk; utilization of atmospheric nitrogen, nitrification, etc. (pp. 189-487); and enzymes (pp. 488-630).

In regard to the ferment nature of peroxidase, A. HESSE and W. D. KOOPER (*Ztschr. Untersuch. Nahr. u. Genussmit.*, 24 (1912), No. 5, pp. 301-309).—A discussion of Grimmer's statements in regard to peroxidase (E. S. R., 27, p. 803) is followed by the results of some experiments relative to the nature of peroxidase in milk.

It is shown that the reaction, when brought into contact with certain reagents, e. g., Rothenfusser's, Storch's, or Arnold's, in the presence of hydrogen peroxid, is due to the catalytic action of iron compounds present in milk. A solution containing less iron (0.004 per cent) than reprecipitated albumin contains produced a marked reaction with Arnold's and Rothenfusser's reagents.

The reason that milk loses its activity after being boiled is the denaturizing of the compounds giving the peroxidase reaction. Lactic acid, sodium thiosulphate, and ethyl, methyl, and amyl alcohols destroy or inhibit the appearance of the peroxidase reaction in milk. The same inhibition was noted when the various chemical substances were added to a solution of iron lactate, which, under ordinary conditions in the presence of hydrogen peroxid will give the same reaction as milk.

Mercuric chlorid and chloroform, two pronounced enzym poisons, do not visibly affect the appearance of the reactions in either the iron solution or milk. Rothenfusser's reaction can be stimulated to greater intensity by other substances present in milk, such as alkali phosphates, carbonates, and citrates. These alkaline substances are inactivated by boiling.

Cleavage of α - and β -methyl glucosid by *Aspergillus niger*, A. W. DOX and R. E. NEIDIG (*Biochem. Ztschr.*, 46 (1912), No. 6, pp. 397-402, fig. 1).—In the experiments 8 species (*A. niger*, *A. clavatus*, *A. fumigatus*, *Penicillium camemberti*, *P. expansum*, *P. chrysogenum*, *P. roqueforti*, and *P. digitatum*) were cultivated in a solution consisting of 0.5 gm. magnesium sulphate, 1 gm. sodium phosphate, 0.5 gm. potassium chlorid, 2 gm. ammonium nitrate, and 0.01 gm. ferrous sulphate in 1,000 cc. of water for the purpose of studying the effect of α - and β -methyl glucosids upon the intensity of the growth. There was approximately 2 per cent of the methyl glucosids present. The fungi grew much better in the β -methyl glucosid than in the α form.

A. niger acts only slightly on the β form, and practically not at all on the α -methyl glucosid. Yeast, on the other hand, acts only on the α form.

Determination of alkalis in silicates by decomposition with calcium chlorid, E. MÄKINEN (*Bul. Com. Geol. Finlande*, 1911, No. 26, pp. 8).—The method suggested is as follows: Five gm. of the finely powdered silicate, and the greatest part of 5 gm. of dry calcium chlorid is mixed and placed in a platinum crucible (of such a size that the mixture will not fill more than two-thirds of the vessel); the remainder of the calcium chlorid is spread over the mixture, and the crucible heated with a slight flame for from 5 to 10 minutes in order to dry the moist calcium chlorid. The flame is then gently raised until all of the calcium chlorid is melted, after which it can be raised to any height without any danger of the mixture spurting. The heating is continued until the melt begins to solidify, which requires about one-half hour. After cooling, the mass is treated according to the J. Lawrence Smith method, that is, it is

digested, preferably in a platinum dish, with hot water until it is resolved into a loose condition.

The residue, insoluble in water, is removed by filtration, and the calcium in the filtrate is precipitated with ammonium hydroxid and ammonium carbonate. As the precipitate occupies a comparatively large space, it is redissolved in dilute hot hydrochloric acid and reprecipitated with ammonium hydroxid and ammonium carbonate. The combined filtrates are evaporated to dryness, and after driving off the ammonium salts with the aid of heat, the residue is dissolved in the smallest possible amount of water. The last traces of calcium are precipitated from this solution in a platinum dish with ammonium hydroxid and ammonium carbonate, allowed to stand for several hours, and filtered into a small tared platinum dish in which the alkalis, after removing the ammonium salts, are weighed. The potassium is then determined as potassium platinic chlorid, and from the difference the sodium is calculated.

Tests were made for the purpose of determining the amount of potassium and sodium in calcium chlorid, and some other tests to determine whether the alkali chlorid contained calcium, magnesium, or sulphuric acid.

The J. Lawrence Smith method gave lower results, but the author's method was easy to conduct.

New methods for the examination and judgment of soils, J. KÖNIG (*Abs. in Ztschr. Angew. Chem.*, 25 (1912), No. 39, pp. 2001, 2002).—The methods mentioned are chiefly those already noted in the literature, namely, the determination of the catalytic power of soils and the nutrients made soluble by treatment with steam under pressure (E. S. R., 17, p. 1138); determination of the inorganic nutrient substances which can be liberated as a result of oxidizing humus (E. S. R., 19, p. 718); influence of a strong constant electric current upon the soil; determination of the osmotic pressure (E. S. R., 21, p. 409; 26, p. 217), and the electrical conductivity of the soil (E. S. R., 24, pp. 521, 522; estimation of the amount of colloids in soils (E. S. R., 26, p. 519); the use of dialysis in the examination of soils; and determination of the oxidizing capacity of the soil.

At present the author is engaged in separating the components of the soil with solutions of various specific gravities, i. e., mixtures of bromoform and benzol, specific gravity 2.65, 2.5, 2.4, 2.3, etc. These results will be reported upon later. See also a previous note by May and Gile (E. S. R., 21, p. 220).

The determination of lime in cow feces, R. A. DUTCHER (*Jour. Indus. and Engin. Chem.*, 5 (1913), No. 1, pp. 37, 38).—It is maintained that methods of ash analysis are very lax with reference to the acid treatment of the ash. The author was unable to find anything in the literature in regard to the analysis of the ash in cow feces. He suggests that "the ash be boiled at least 3 hours with concentrated nitric or hydrochloric acid, and that the acid-insoluble residue be evaporated to dryness with dilute sodium hydroxid to break up all silicates. This alkaline residue should then be taken up with dilute acid and added to the original solution for analysis."

Water analysis for sanitary and technical purposes, H. S. STOCKS (*London, 1912, pp. VIII+136, figs. 8*).—This book deals with the physical, organoleptic, and chemical (qualitative and quantitative) analysis of water. Among the topics discussed are deleterious metals; gases contained in solution; standards of purity recommended by the Rivers Pollution Commissioners; tabular view of the standards for effluents adopted by various authorities; average composition of unpolluted water; tension of aqueous vapor; loss of nitrogen by evaporation of NH_4HSO_3 and $\text{NH}_4\text{H}_2\text{PO}_4$; Warington's method of estimating nitrates; and preparation of reagents required for water analysis. Several conversion tables are included.

Methods of analysis used in the laboratories of the Armour Institute of Technology.—Mineral analysis of water (*Chem. Engin.*, 17 (1913), No. 3, pp. 117, 118).—The methods described are for total solids, silica, iron and aluminum, calcium, magnesium, sulphuric acid, alkalis, carbonates, chlorids, and free carbon dioxide. The methods of calculating the results are also given.

Food control by police officials, W. BREMER (*Die Nahrungsmittelkontrolle durch den Polizeibeamten*. Berlin, 1910, pp. IV+73).—This is a description of methods of sampling for food inspection purposes. The substances which are prohibited are described in detail.

A rapid method for determining fat in cacao with the Zeiss refractometer, O. RICHTER (*Ztschr. Untersuch. Nahr. u. Genussmitl.*, 24 (1912), No. 5, pp. 312–319).—The methods for determining fat in milk are not applicable to the determination of this constituent in cacao, but the use of the refractometer for this purpose suggested itself. The method which apparently gave good results embodied extraction of the material with ether-alcohol-trisodium phosphate solution, determining the refraction of the fat, and calculating the amount of fat present from the results by tables which are included.

Changes in the methods for determining succinic and malic acids in wine, C. VON DER HEIDE and E. SCHWENK (*Ztschr. Analyt. Chem.*, 51 (1912), No. 10–11, pp. 628–638).—A modification of the methods originally suggested by von der Heide and Steiner (*E. S. R.*, 21, pp. 304, 305).

Studies in regard to the dry substance (total solids) of milk, A. SPLITTGERBER (*Ztschr. Untersuch. Nahr. u. Genussmitl.*, 24 (1912), No. 8, pp. 439–507).—A study was made for the purpose of determining to what degree the milk constituents suffer decomposition when dried for a long time.

The changes produced in the dry substance were, in most instances, primarily due to the presence of lactic acid. This acid, when heated at the usual drying temperatures, will volatilize almost completely, but when present with either casein, albumin, protein, lactose, or in milk itself, it becomes bound or fixed to these constituents. The remainder of the acid present is decomposed, this being entirely dependent upon the amount present and the time of drying.

A loss in weight for normal milk, due to the presence of lactic acid, is usually not noted during the first hour of drying, but after 2 hours it is appreciable. Casein, a mixture of milk sugar and phosphates, and casein with milk and phosphates after drying over 1 hour showed a marked loss in weight. According to these findings the figures obtained by the usual drying methods do not represent the sum of the total solids of milk, but those given after 1 hour of drying are probably correct.

This behavior of lactic acid probably explains the fact that in the determination of the solids in sour milk the figures obtained do not correspond with those given by the calculation methods.

The conservation of samples of milk destined for analysis, X. ROCQUES (*Ann. Chim. Analyt.*, 17 (1912), No. 11, pp. 413–418).—One gm. of bichromate of potash per liter is generally used in France for preserving milk intended for analysis, but if the bichromate is added to milk in which decomposition has already set in disintegration proceeds more rapidly. Thinking that it was the lactic acid which destroyed the preserving power of the bichromate, the author made some tests with solutions of these substances. He found that lactic acid reduced bichromate. The bichromate had no effect upon lactose, but lactose seemed to accelerate the decomposition of the bichromate.

The conclusion is reached that bichromate of potash is an excellent preservative for samples of fresh milk, but that when the sample is in a state of decomposition it is necessary to examine it as quickly as possible.

The preservation of milk samples destined for analysis, G. DENIGÉS (*Ann. Falsif.*, 5 (1912), No. 50, pp. 559-561).—Despite the conclusion of Rocques, noted above, that bichromate of potash is a satisfactory preservative for milk samples, it is maintained that the method does not work well in everyday practice. The recommendation of Dubois for the substitution of a solution of 50 gm. of phenol in 10 cc. of 95 per cent alcohol, using 1 cc. of this preservative to 100 cc. of milk, was found very satisfactory by the author. Some of Dubois's analyses made in 1900, also an analysis made of one of the samples collected in 1900 and reanalyzed in 1910, are shown. Practically no change in the composition of the sample took place.

The detection of peanut oil in olive oil, L. ADLER (*Ztschr. Untersuch. Nahr. u. Genussmtl.*, 23 (1912), No. 12, pp. 676-679, fig. 1).—A description is given of a modification of the Franz method in which it is possible to detect an addition of at least 5 per cent of peanut oil to olive oil.

One cc. of the oil and 5 cc. of an 8 per cent alcoholic potassium hydrate solution (80 gm. of potassium hydrate treated with alcohol and enough 90 per cent alcohol to make 1 liter) are placed in a 100 cc. Erlenmeyer flask provided with an 80 cm. cooling tube. The mixture is heated for 4 minutes in a boiling water bath, shaken frequently, and cooled to 25° C.; 1.5 cc. of dilute acetic acid (1 volume acetic acid and 2 volumes water) and 50 cc. of 70 per cent alcohol by volume are added; the mixture is then shaken and allowed to stand.

If the solution does not clear up, it should be heated until clarification has taken place, then cooled to exactly 16°, shaken repeatedly at this temperature for a period of 5 minutes, and if no definite turbidity is noted, cooled to 15.5°. If no turbidity is produced after another 5 minutes, the oil contains less than 5 per cent of peanut oil.

The detection of peanut oil in olive oil according to the Franz-Adler method, H. LÜERS (*Ztschr. Untersuch. Nahr. u. Genussmtl.*, 24 (1912), No. 11, pp. 683, 684).—Two samples of olive oil which were examined according to the Franz-Adler method showed a marked precipitate at 16° C., which pointed, according to the originators of the test, to the presence of about 5 per cent of peanut oil. On the other hand, when the oils were examined by the lead salt method of Torelli and Ruggeri (*E. S. R.*, 10, p. 413), peanut oil was apparently absent. A chemical study then made of the oils showed that the precipitate produced in the Franz-Adler test in these instances consisted of a potassium salt of myristic acid, and consequently it was assumed that these oils were characterized by a high myristic acid content. The amount of acid added in the Franz-Adler test is considered insufficient to cause the liberation of the entire acid in every instance, and consequently a precipitate of the acid salt is produced at from 15 to 16°.

On the basis of the above findings the method was modified.

Technical accounting and chemical control in sugar manufacture, D. L. DAVOLL, JR. (*Jour. Indus. and Engin. Chem.*, 5 (1913), No. 3, pp. 231-234; 4, pp. 313-319, figs. 6).—A detailed description of the topic, which includes the chemical methods utilized in sugar control.

The sugar content of maize stalks, G. N. BLACKSHAW (*So. African Jour. Sci.*, 9 (1912), No. 3, pp. 42-48).—Continuing previous work (*E. S. R.*, 27, p. 314), the author reports results of more extensive experiments with Hickory King, Boone County, Salisbury White, Golden Eagle, and Sweet corn, sown November 9. From a portion of each plot, the cobs were removed in a milky condition on April 2, and the juice of stalks selected from the cobbed and uncobbed portions analyzed periodically until the crop reached maturity.

All of the cobbed plants, with the exception of Sweet corn, examined between April 10 and May 23, i. e., from 8 to 51 days after removing the cobs, showed

an average sucrose content of 12 per cent. In the juice from the stalks of plants on which the cobs were allowed to remain, the average amount of sucrose was 8.2 per cent. Plants cobbled at the same period, that is, between April 2 and 9 showed an average of 11.5 per cent of sucrose. It is estimated that the stalks would yield about 585 lbs. of sucrose per acre, and 80 lbs. of glucose.

Objectionable nitrogenous compounds in sugar-cane juice, F. ZERBAN (*Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York], 8 (1912), Sect. Va, pp. 103-111*).—After reviewing the literature pertaining to the injurious nitrogen which is contained in very small amounts in sugar-cane juice, the author states that none of the different substances reported, viz, leucin, asparagin, glutamin, and glycocoll has been definitely identified. As a result of the investigation it was found that the mercuric precipitate from sugar-cane juice contains principally asparagin, and small amounts of glutamin and tyrosin. The fact that asparagin was present is corroborated by L. M. Dennis of the laboratory of Cornell University.

The investigations were carried out in two different places. "The first of these, the Agricultural Experiment Station in Tucuman, Argentina, lies within the Temperate Zone, while the second, the experiment station of the Porto Rico Sugar Producers' Association, is in the Tropics. The methods used were practically the same in both places."

The practical results to be obtained by determining the injurious nitrogen in sugar beets, G. FRIEDL (*Kisérlet. Közlem., 15 (1912), No. 5, pp. 801-808*).—The figures for available white sugar on the basis of the injurious nitrogen content of the beet were lower than the values shown by Stammers' calculations. The amount of molasses obtained agreed well with the injurious nitrogen determination. Very valuable data can be obtained by determining the injurious nitrogen colorimetrically (E. S. R., 23, p. 514).

Inversion of saccharose and its relation to the qualitative changes of various feed beets during storage, W. JEKELIUS (*Kühn Arch., 2 (1912), pt. 1, pp. 149-192, figs. 3*).—The relation noted by Stephani (E. S. R., 29, p. 111) between the diminution of polarization and the formation of invert sugar with various kinds of beets during storage was confirmed by this investigation. Varieties with a high sugar and dry substance content showed a lower inverting capacity than beets having a low total solid content, while the tendency to invert sugar formation stood in a direct relation to the yield of beets. No relationship between inverting capacity and the other constituents of beets, i. e., nitrogen, protein, ash, and the ash constituents, could be established.

The inversion noted seems to be a purely physiological process, but it is also influenced by external conditions. For instance, injuring a beet, or boring brings about a marked inversion of the saccharose. Temperature and the methods of storage also influence the degree of inversion. Total sugar and dry substance seem to run fairly parallel also in stored beets. Accordingly, the estimation of the dry substance in the spring in beets high in invert sugar will give us a better measure than will the polarization test. With varieties which show a low degree of inversion, polarization in the spring will give the identical figures obtained with the gravimetric method for total sugars.

The determination of total sugars stands in direct relation to the formation of invert sugar; there are, however, varieties and individual beets which can produce up to springtime considerable invert sugar without showing marked loss of total sugar. Inversion and polarization of sugar can, according to this, be two functions which are independent of one another.

Manufacture of a sugar-beet flour (beet meal), and its use in the alimentation of man and beast, A. AULARD (*Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York], 25 (1912), Sects. I-Ve, pp. 479-483*).—This

describes the method of preparing beet meal by a drying process. The product has a composition as follows: Protein, 6.6; saccharose, 65.5; other carbohydrates, 12.75; cellulose (saccharifiable), 5.2; ether extract, 0.75; water, 5.4; residue, inert material, salts, etc., 3.8 per cent. The cost of drying the material under conditions prevailing in Belgium and France is also discussed.

Composition of apples and pure ciders of the lower Seine regions, C. BEIUX (*Ann. Falsif.*, 6 (1913), No. 51, pp. 32-39).—This deals with the composition of the apples harvested in 1911 and the cider made therefrom. Ciders made from a single variety of apples and several varieties of apples are considered.

Cider vinegar and its making, P. J. O'GARA (*Off. Path. and Ent. Rogue River Valley Oreg. Circ.* 1, 1912, pp. 4).—This is a short popular description of making vinegar from pure apple juice, issued for the purpose of pointing out a method for utilizing cull apples which would otherwise go to waste.

The composition of pure wine from American native grapes, W. B. ALWOOD (*Abs. in Orig. Commun.* 8. *Internat. Cong. Appl. Chem.* [Washington and New York], 26 (1912), Sects. VIa-XIb, pp. 35, 36).—This paper deals with experiments on the manufacture of straight wines from 8 native grapes, the purpose being to ascertain the facts in regard to the composition of pure grape must after it has been fermented to dryness.

The alcohol industry of the Philippine Islands, H. D. GIBBS (*Philippine Jour. Sci.*, Sect. A, 6 (1911), Nos. 2, pp. 99-145, pls. 8, figs. 3; 3, pp. 147-206, pls. 12, figs. 5).—This deals with the study of the nipa palm, coconut palm, buri palm, and sugar palm, with special reference to the saps and their uses. Among other factors it discusses the tapping of the palm, the yield, composition, and utilization of the sap, the occurrence of mannitol in palm saps, the sap of the coconut palm as a source of sugar and vinegar, the economic factors concerned in the production of sugar, etc.

The cooperative manufacture of casein, P. DORNIC (*Indus. Beurre*, 7 (1912), Nos. 28, pp. 325-327; 29, pp. 337-339; *abs. in Internat. Inst. Agr.* [Rome], *Bul. Bur. Agr. Intel. and Plant Diseases*, 3 (1912), No. 9, p. 2079).—A small society at Sainte-Soulle, manufacturing casein from skim milk from June 1, 1911, to May 31, 1912, utilized 366,600 gal. of skim milk, which yielded 114,185 lbs. of casein, and a profit greater than had previously been received from feeding the skim milk to pigs.

Synthetic tannin, B. F. CHASE (*Daily Cons. and Trade Rpts.* [U. S.], 16 (1913), No. 106, p. 673).—The preparation which is termed "Neradol" is made by sulphonating cresylic acid and combining it with formaldehyde. The preparation is supposed to be somewhat similar to ordinary tanning extract, and forms a light brown solution in water. It is reported that a number of tests have been made with sheep, calf, and other skins with apparently satisfactory results.

The effect of "lime-sulphur" spray manufacture on the eyesight, J. R. WITHROW (*Jour. Indus. and Engin. Chem.*, 4 (1912), No. 10, pp. 735-737).—This is a description of some cases where the eyes of workmen engaged in the preparation of lime-sulphur wash became inflamed, resulting in blurred vision. This was especially the case on cold days, when the opportunities for proper ventilation of the factories were poor.

METEOROLOGY—WATER.

Syllabus of questions on the relation between meteorological information and agricultural practice, W. N. SHAW (*Rpt. Brit. Assoc. Adv. Sci.*, 1912, pp. 738, 739).—A series of questions designed to bring out the relation between climatic conditions and plant growth is given.

"Surface" climate, W. L. BALLS (*Rpt. Brit. Assoc. Adv. Sci.*, 1912, pp. 739, 740).—This article calls attention to the wide variations in temperature, humidity, etc., which may occur among crops within even a few inches of altitude. It is stated that in observations on the cotton crop in Egypt it was found "that a puff of wind arising during an otherwise calm, clear night will raise the temperature of the crop by more than 5° C. Since the growth of the plant is controlled chiefly by night temperature, such a rise is not without importance. The explanation lies in the removal of air which has been chilled by radiation from the plant, and its replacement by air at 'screen temperature.' Transpiration of water from the plant is negligible at night."

Meteorological conditions in a field crop, with a description of two simple recorders, W. L. BALLS (*Quart. Jour. Roy. Met. Soc. [London]*, 39 (1913), No. 166, pp. 109-113, figs. 3).—This article reports the results of observations on temperature, humidity, and wind movement in a field of cotton in Egypt as noted in the abstract above. It also describes simple forms of an anemograph and a differential thermograph used in these observations.

Meteorological yearbook for 1913 (*Annuaire Météorologique pour 1913. Brussels, 1912*, pp. VI+323, pls. 39, figs. 7).—This volume contains a climatological review for Belgium for 1912, a summary of meteorological observations at the Uccle observatory, and a detailed study of hail and other storms in Belgium, besides special articles on the Besson nephoscope, comparative tests of different forms of shade thermometers, ascensions of sounding balloons, temperature of the North Sea, and infiltration of meteoric waters in the soil as measured by a lysimeter.

Temperature records, J. B. THOMPSON (*Guam Sta. Rpt. 1912*, pp. 28, 29, figs. 2).—Records of maximum and minimum temperatures at the Guam Station throughout the year ended June 30, 1912, are shown in charts.

Rain and its measurement, L. DUMAS (*Ann. Gembloux*, 23 (1913), No. 6, pp. 261-299).—The author deals in a broad general way with the phenomenon of rainfall and with rain and snow in their relations to climate, locality, and agriculture. He discusses evaporation from air and soils, humidity, temperature, and intensity of rainfall in their relations to each other, and also the accuracy of rain gages. He takes up particularly the relation of rainfall to soil and vegetation, considering as the normal rainfall for a region that amount which satisfies the average cultural conditions.

Conservation of rainfall, W. J. SPILLMAN (*U. S. Senate, 63. Cong., 1. Sess., Doc. 228, 1913*, pp. 5).—Attention is called in this document to the beneficial results obtained by the use of a system of embankments for conserving rainfall and preventing soil erosion on a light sandy soil which includes forests, pastures, and cultivated fields.

Surface water supply of the South Atlantic coast and eastern Gulf of Mexico drainage basins, 1911, M. R. HALL and C. H. PIERCE (*U. S. Geol. Survey, Water-Supply Paper 302, 1913*, pp. 90, pls. 4).—This paper reports the results of measurements of flow made during 1911, in the James, Roanoke, York, Savannah, and Altamaha river basins on the South Atlantic coast, and in the Apalachicola, Choctawhatchee, Escambia, and Mobile river basins of the east coast of the Gulf of Mexico. Tables are also included giving gage heights and daily and monthly discharges at each station. A summary of the discharge per square mile indicates an almost entire lack of uniformity or agreement between any two stations.

Geology and ground waters of Florida, G. C. MATSON and S. SANFORD (*U. S. Geol. Survey, Water-Supply Paper 319, 1913*, pp. 445, pls. 16, figs. 7).—This paper gives a detailed report on the geography, stratigraphy, and geologic his-

tory of Florida, with special reference to its underground water. The water supply of each county as well as of the State as a whole is discussed with reference to its source, quality, and development, and tables giving data for typical wells of the State are added to many of the county descriptions. The illustrations include a general topographic and geologic map of Florida, a map of its Pleistocene terraces, a diagram showing the importance of choosing proper locations for wells, and half-tones showing features of geologic interest.

Surface water supply of the Ohio River basin, 1911, A. H. HORTON, M. R. HALL, and H. J. JACKSON (*U. S. Geol. Survey, Water-Supply Paper 303, 1913, pp. 112, pls. 4*).—This paper reports results of measurements of flow made on the Ohio River and its tributaries during 1911. Tables are also included giving gage heights and daily and monthly discharges at each station. A comparison of relative rates of run-off from different areas in this basin shows an almost entire lack of uniformity or agreement between any two streams.

The Ohio Valley flood of March-April, 1913, A. H. HORTON and H. J. JACKSON (*U. S. Geol. Survey, Water-Supply Paper 334, 1913, pp. 96, pls. 22*).—This report contains available recent flood data from the Ohio River Valley, together with facts concerning earlier floods, which are presented primarily for comparison with those concerning the flood of 1913. It is attempted to show what can and should be done in collecting the data necessary for a complete report on the floods in the Ohio Valley and emphasizes the necessity of immediately starting, on a comprehensive scale, the collection of stream-flow data not only from the Ohio itself but from its larger tributaries to the end that a definite decision may be reached as to the best and most economical means of preventing damage by floods.

Geology and water resources of Sulphur Spring Valley, Ariz. (*U. S. Geol. Survey, Water-Supply Paper 320, 1913, pp. 1-187, 214-231, pls. 14, figs. 32*).—This work represents a cooperative investigation, between the United States Geological Survey and the Arizona Experiment Station, of the ground waters and possibilities of irrigation in the valley.

The physiography and drainage; geology; rainfall; occurrence; level, and quality of ground water; vegetation in relation to water and other geographic controls; and the artesian conditions of the valley are discussed in some detail by O. E. Meinzer (pp. 1-187), together with an investigation of the concentration, distribution, and general effect of the alkalis in the soil and water. Sodium carbonate is said to be the most harmful alkaline constituent in the soil, and where the depth to water is less than 15 ft. the soil usually contains injurious amounts of alkali, while where the depth is more than 15 ft. the soil is usually free from injurious amounts.

In addition there is a discussion by R. H. Forbes (pp. 214-224) of the agricultural resources of the valley, in which it is stated that dry farming and flood water farming are uncertain methods of culture there, while dry farming supplemented with a pumped water supply is a more certain method. See also a previous note (*E. S. R.*, 29, p. 725).

Ground water in Boxelder and Tooele counties, Utah, E. CARPENTER (*U. S. Geol. Survey, Water-Supply Paper 333, 1913, pp. 90, pls. 2, figs. 9*).—The chief purpose of this paper is to report an investigation made to determine the feasibility of irrigating by use of underground water in this region, which includes Boxelder and the eastern part of Tooele counties, Utah, and some small tracts in southern Idaho. The physiography, geology, climate, vegetation, soil, and industrial development of the region are discussed in some detail and the occurrence and quality of ground water supplies are taken up by areas, mainly from the standpoint of their availability and use for irrigation purposes. In

addition information is given regarding the location of watering places on routes of travel for the benefit of strangers traveling through the region.

The pollution of underground waters with sewage through fissures in rocks, H. ALBERT (*Science, n. ser.*, 38 (1913), No. 972, pp. 238, 239).—A case of supposed pollution of underground waters through rock fissures is noted. A water supply taken from three deep wells became polluted from the deepest well which was sunk at the bottom of a shaft used previously for water supplies and extending through 31 ft. of alluvial soil and clay, 6 ft. of limestone, 27 ft. of blue shale, 6 ft. of limestone, and 42 ft. of sandstone. From the nature of the existing strata and from bacteriological and clinical examinations of the water it is concluded that polluted river and ground water passed readily through the top layer of soil and gravel to and through the fissures in the upper layer of limestone to and along the relatively impermeable layer of shale in the direction of least resistance toward the shaft.

The sewage sludge problem and its solution, J. GROSSMANN (*Surveyor*, 43 (1913), No. 1117, pp. 926-928).—A paper on this subject is given in abstract with discussion.

The Grossmann process for recovery of grease and preparation of a sludge fertilizer in use at Oldham, England, is described. The sludge fertilizer obtained is a dry, friable, inodorous material containing about 2 per cent of ammonia, from 3 to 5 per cent of calcium phosphate, and $1\frac{1}{2}$ per cent of potash salts, and is in demand by farmers. It is said to furnish a good basis for mixed fertilizers.

SOILS—FERTILIZERS.

Soils of the United States, C. F. MARBUT, H. H. BENNETT, and J. E. and M. H. LAPHAM (*U. S. Dept. Agr., Bur. Soils Bul. 96, pp. 791, pls. 15*).—This is a combination of features of Bulletins 55 and 78 of the Bureau of Soils (E. S. R., 20, p. 915; 25, p. 426), revised to January 1, 1912. It describes the soils of this country as far as they are known at present, and includes also a discussion of methods of soil classification.

A study of the soils of Macon County, Alabama, and their adaptability to certain crops, G. W. CARVER (*Alabama Tuskegee Sta. Bul. 25, pp. 5-13*).—The soil types of the county, as defined by the Bureau of Soils, are described and their crop adaptations and methods of management are discussed. With the exception of the Norfolk coarse sand and Norfolk gravelly loam, which are so porous as to be nearly always in a drought-stricken condition, the soils are generally well adapted to the growing of field, garden, and fruit crops, and nuts. Among the fruits which may be successfully grown are apples, pears, plums, grapes, figs, strawberries, blackberries, mulberries, and pomegranates. The clay soils are said to need drainage especially, and deep cultivation and the addition of vegetable matter are suggested for all the types.

The gullied lands of west Tennessee, A. H. PURDUE (*Resources Tenn.*, 3 (1913), No. 3, pp. 119-136, figs. 8).—Attention is called to the enormous annual waste from soil wash in western Tennessee. The tendency of the soils of that locality to wash is attributed to the fact that they are loose and sandy and contain more or less clay. The conditions favorable for rapid wash of sand clay soils are stated to be steep slopes, rapid rainfall, and absence of vegetation.

Deep, close plowing, parallel to the contours and turning of the soil down hill, are urged as measures for preventing wash. It is pointed out that the existence of gullies in fields causes the ground water level to sink beyond the reach of plants and also tends to leach out and drain away soluble soil constituents and fertilizers. To prevent this and to check the spread of wash it is

suggested that the mouths and heads of gullies be filled with logs, brush, briars, and grass.

It is stated that all of the waste lands of western Tennessee can be reclaimed for one of three purposes, namely, agriculture, pasture, or timber.

The sulphur content of some typical Kentucky soils, O. M. SHEDD (*Kentucky Sta. Bul.* 174, pp. 269-306).—Examinations of representative samples of soil from the various geological areas in the State indicate that constant cultivation without manuring has resulted, in some cases, in a very large loss of sulphur as compared with the amounts in corresponding virgin soil. This was true of both surface soils and subsoils. As a rule, the better agricultural areas showed a higher content of both sulphur and phosphorus. Surface soils generally contained more sulphur than the corresponding subsoils.

The general conclusion is that any system of soil maintenance which does not include the addition of sulphur in some form will probably prove a failure.

Analysis of coconut soils, J. DE VERTEUIL (*Dept. Agr. Trinidad and Tobago Bul.*, 11 (1912), No. 71, pp. 184-186).—Results of analyses of 11 samples of soils on which coconuts were being grown are reported and briefly discussed. The soils are fairly heavy clays, the proportion of clay increasing with the depth. An attempt is made to correlate the health and vigor of the coconut palms with the available plant food in the soil, but without conclusive results.

Some Lybian soils, A. MAUGINI (*Agr. Colon. [Italy]*, 7 (1913), No. 9, pp. 321-332).—Mechanical, physico-chemical, partial chemical, and mineralogical analyses were made of six samples of soil, three of which were taken from interior oases and three from dry stream beds in the Lybian Desert.

The substrata of the oases, although they are widely separated, were identical, consisting of variegated clay marl alternating with streaks of silicious limestone. The substrata of the dry stream beds were composed of alluvial earth derived from the disintegration of the limestones and marls which formed the original stream bed.

The vegetation of the oases consisted of date palms, cereals, legumes, olives, figs, pomegranates, cotton, tobacco, and barley. That of the dry stream beds consisted of several tropical plants, common Bermuda grass, and a kind of legume.

The soils examined varied in color from reddish gray to dark brown and were found to be either slightly alkaline or neutral. They belong in general to the category of loose soils, being often deficient in grit and composed mainly of small particles, although the content of impalpably fine particles is small. To this is attributed the small water-holding capacity and permeability of these soils.

The soils contained a relative abundance of potash, very little of which, however, was in a form to be available for plants. Organic matter and consequently nitrogen and also phosphoric acid were insufficient in both quantity and availability. Mineralogically all the soils with the exception of one stream bed sample had essentially the same composition, quartz incrustated with iron oxid predominating in the fine earth. The greatest difference in the soils from the two sources was in the quantity of carbonates, which was small in the oasis soils and large in the stream bed soils.

The fine earth in the oasis soils was largely sandy material while in the dry stream bed soils it was largely clay. The structure of the dry stream bed soils is deemed the better of the two. A comparison of these interior oasis soils with those of coastal oases leads to the conclusion that they are from a common origin.

The alkaline soils in Egypt and their treatment, V. M. MOSSÉRI (*Bul. Inst. Égyptien*, 5. ser., 5 (1911), No. 1, pp. 53-79).—An examination of unproductive soils in different parts of Egypt showed the widespread existence of injurious alkali, consisting principally of carbonate, bicarbonate, chlorid, and sulphate of sodium. Of these the carbonate is considered the most injurious to both plant growth and the physical condition of the soil, it being found without exception that unproductive, compact, impervious soils difficult to drain contained sodium carbonate in large or small amounts, and also bicarbonate in amounts usually from two to three times those of the carbonate. A strong soil containing 0.08 per cent of sodium carbonate is said to be rendered absolutely useless. The bicarbonate of sodium, however, is considered to be less harmful than the chlorid.

It was demonstrated that gypsum in proper amounts, in addition to overcoming the toxic effect of sodium carbonate, corrected its effect on the porosity and permeability of the soil. It is concluded in general that the gypsum should be applied in double the amount theoretically required and in two or three treatments well distributed and well mixed with the top layer of soil. A copious irrigation after a treatment is said to aid the chemical reaction between the gypsum and the sodium carbonate, and good drainage is considered indispensable.

Tests of the solubility of the local gypsums relative to fineness are recorded, the solvents used being water, 1 per cent hydrochloric acid, and one-hundredth normal hydrochloric acid. It is concluded that a degree of fineness allowing it to pass a sieve having 34 meshes per linear centimeter is sufficient.

The movements of soil water in an Egyptian cotton field, W. L. BALLS (*Jour. Agr. Sci. [England]*, 5 (1913), No. 4, pp. 469-482, figs. 7; *abs. in Internat. Inst. Agr. [Rome]*, Mo. *Bul. Agr. Intel. and Plant Diseases*, 4 (1913), No. 12, pp. 1845-1847).—This paper describes and discusses a series of soil water determinations made in a field of cotton at Giza, in Egypt. These were made every three or four days alternately and at 20 cm. intervals down to 160 cm. The soil is alluvial the first 30 cm., the next 60 cm. stiff clay, the next 110 cm. loam to sandy loam, and below 200 cm. stiff clay. The rate of evaporation from this field of cotton plants averaged about 20 tons per acre of water a day from May to October.

The chief conclusions drawn from these determinations are as follows: (1) The depth of root may be roughly traced by its drying effect on the soil, which combined with a change in surface climate causes a reversal of the humidity gradient so that deep soil is drier than surface soil in September. (2) Application of irrigation water to the surface is evidence to an indefinite depth and absence of such evidence is due to imperfection in the method of observation. (3) Determination of soil water content in an Egyptian cotton field by random sampling is almost worthless unless due regard is paid to the seasonal variation. (4) The water of the water table when within 2 meters of the surface may be utilized by the crop. (5) A rise of the water table is analogous to surface irrigation and there is some indication of a direct hydraulic thrust in both cases.

The water balance and losses of plant food in fallow loam and sandy soils, 1905-1912, C. VON SEELHORST ET AL. (*In Festschrift zum siebenzigsten Geburtstage von Jacob Esser*. Berlin, 1913, pp. 1-27; *Jour. Landw.*, 61 (1913), No. 3, pp. 189-215).—The investigations summarized in this article were made in vegetation tanks of $1\frac{1}{2}$ cubic meters content.

The results show that evaporation was larger from the loam than from the sandy soil, each being repeatedly cultivated each summer during the period

covered by the experiments. The losses of plant food in the drainage were as follows:

Losses of plant food in drainage water from loam and sandy soils in pounds per acre.

Year.	Nitrogen.		Lime.		Magnesia.		Sulphuric acid.	
	Sandy soil.	Loam.	Sandy soil.	Loam.	Sandy soil.	Loam.	Sandy soil.	Loam.
	<i>Pounds.</i>	<i>Pounds</i>	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>
1908.....	17.4	34.5	161.3	212.7	17.1	28.5	88.7	84.4
1909.....	19.3	55.1	235.8	230.9	23.8	41.4	114.1	101.4
1910.....	15.9	60.2	221.9	295.5	21.3	44.3	116.0	148.5
1911.....	13.8	26.2	98.3	115.4	11.6	22.2	55.3	42.0
1912.....	61.1	95.0	377.1	356.7	23.6	52.7	177.6	164.9

On a new method of measuring the capillary lift of soils, C. J. LYNDE and H. A. DUPRÉ (*Jour. Amer. Soc. Agron.*, 5 (1913), No. 2, pp. 107-116, figs. 3).—The apparatus used in the method proposed, which is similar to that of Askenasy (*E. S. R.*, 7, p. 19), consists essentially of an ordinary glass funnel 4 cm. in diameter connected with a thick-walled capillary tube about 90 cm. long by means of a piece of rubber tubing. This joint is water sealed by means of "a glass tube, 2 cm. in diameter and 15 cm. long, closed at the bottom with a rubber stopper through which the capillary tube passes. The seal is filled with water and prevents air from entering about the rubber tube."

In using this apparatus a 6-gm. sample of soil is allowed to stand over night in water. It is then boiled for a short time to expel air. The funnel is fitted with a cotton cloth filter 2 cm. in diameter. A cup of a centrifuge is filled with distilled water previously boiled to expel the air and the funnel with its filter is placed in the cup, being supported by the rim of the cup. Part of the hot mixture of soil and water is poured into the funnel and the soil is settled by centrifuging. This process is repeated with more soil and water until the soil is well above the edge of the cloth filter. The capillary tube with the rubber tube attached is then filled with water previously boiled to expel air, and the funnel is inserted in the rubber tube, care being taken in doing this not to allow air to enter the funnel or tube and to avoid disturbing the soil. The lower end of the capillary tube is placed in a cup of mercury and the water seal is filled with boiled distilled water. When evaporation sets in from the surface of the soil in the funnel the mercury rises in the capillary tube and the maximum capillary lift is found by multiplying the length of the mercury column in centimeters by 13.6 and adding the length in centimeters of the water column from the top of the mercury column to the middle of the soil layer.

The advantages claimed for this method are that the moisture moves through a very short column of wet soil, reducing friction to a minimum; the time required to make a measurement is greatly reduced; and the final measurement is a fairly accurate index of the capillary lift of the soil, being approximately three times that measured by the old method. By this method the capillary lift of soil constituents was found to be greater the finer the grains, and a comparison of the calculated and observed lifts showed that the observed lifts fell between the calculated limits in every case except that of clay. The capillary lift of clay was measured under pressures equal to, greater than, and less than one atmosphere, and the results showed that the capillary lift observed by this method is limited by the pressure of the atmosphere and that, therefore, the maximum lift under a pressure of one atmosphere can not exceed 34 ft.

On osmosis in soils: The efficiency of the soil constituents as semipermeable membranes, C. J. LYNDE and H. A. DUPRÉ (*Jour. Amer. Soc. Agron.*, 5 (1913), No. 2, pp. 102-106, figs. 2).—In continuation of previous investigations (E. S. R., 29, p. 124) experiments made with medium sand, fine sand, very fine sand, silt, clay, and fine clay for the purpose of comparing the efficiencies of these soil constituents as semipermeable membranes showed that for the solution used (clay subsoil solution) the sands did not act as semipermeable membrane, but that the silt, clay, and fine clay did so act. The conclusion is drawn that the finer the soil grains in a soil constituent the greater is the efficiency of the soil constituent as a semipermeable membrane.

The method and apparatus used are described.

The action of hydroxyl ions on clay and clay soils in connection with marling, P. ROHLAND (*Landw. Jahrb.*, 44 (1913), No. 3, pp. 437-440).—The hydroxyl ions of calcium and other hydroxids act upon the clay of soil, forming and flocculating colloid substances. This effect is greatest the first time clays and clay soils are subjected to the action of the ions and diminishes when the action is repeated until the clay particles lose the property of forming colloids. This is said to explain the diminishing effect of repeated liming.

The properties of so-called soil zeolites, E. BLANCK (*Fühling's Landw. Ztg.*, 62 (1913), No. 16, pp. 560-581).—The principal results of investigations bearing on this subject are summarized, indicating the lack of exact information as to the so-called zeolites of the soil. These are shown to be in no sense equivalent to the mineral zeolite but may be more properly designated simply as adsorptive gel mixtures of indefinite and variable mineralogical and chemical composition.

Factors in the maintenance of permanent fertility of the soil, E. O. FIPPIN (*Jour. Amer. Soc. Agron.*, 5 (1913), No. 1, pp. 46-49, fig. 1).—A diagram in the form of a monument is presented which "is made up of the general practices available for improving the soil put together according to their functional relations and in the order of their range of influence." The foundation of this diagram is the proper regulation of soil moisture, involving drainage and irrigation. Lime in the form of free lime carbonate constitutes the second course. Organic matter, chiefly in the form of humus, forms the third course. Tillage in its various forms constitutes the fourth course, and plant food in the form of fertilizers is placed last with the elements, phosphorus, sulphur, nitrogen, and potassium, arranged in the order in which they are most likely to be needed.

The agricultural utilization of acid lands by means of acid-tolerant crops, F. V. COVILLE (*U. S. Dept. Agr. Bul.* 6, pp. 13).—The essential features of this paper have already been noted from another source (E. S. R., p. 814). The points emphasized as of special importance to agricultural investigators are "(1) that soil acidity is not always an objectionable condition which invariably requires an application of lime, (2) that under certain economic conditions a complete system of acid-land agriculture is practicable and desirable, and (3) that the extent to which our cheap eastern acid lands can be utilized with small applications of lime, or under some conditions without its use, is a legitimate and important subject for detailed investigation, from which may reasonably be expected results of far-reaching economic importance."

Formation of nitrates in soil after freezing and thawing, T. L. LYON and J. A. BIZZELL (*Jour. Amer. Soc. Agron.*, 5 (1913), No. 1, pp. 45, 46).—Four pots of soil, two containing Volusia silt loam and two Dunkirk clay loam soil on which had been raised a crop of wheat and one of millet were used in these experiments. One pot of each kind of soil was subjected to freezing and thawing and the other two were kept at a temperature above 50° F.

The determination of nitrates in these soils after this treatment showed that freezing had produced a condition of soil favorable for nitrate formation. This

is attributed to the effect of freezing in overcoming the depressing influence of the crops previously grown.

The accumulation of green manure nitrogen in sandy soils, C. VON SEELHORST ET AL. (*Arb. Deut. Landw. Gesell.*, 1913, No. 241, pp. 147, pls. 20).—A summary of the results of 6 years' experiments in vegetation tanks, here reported in detail, has previously been noted (*E. S. R.*, 26, p. 224).

Manures and fertilizers, H. J. WHEELER (*New York*, 1913, pp. XXI+389, pl. 1, figs. 62).—This is the ninth volume in The Rural Text-book Series, edited by L. H. Bailey.

The author states that "the preparation of this volume was undertaken for the purpose of meeting a distinct lack in collegiate agricultural text-books in the United States. It was hoped to prepare a book reasonably free from extended details, such as are found in certain of the larger foreign works, and likewise to avoid the rather superficial treatment of the subjects which has necessarily characterized many of the books which have been written for the purpose of meeting the earlier requirements of the American agricultural colleges, and the present demands of agricultural high schools. The intent has been to provide in a measure for the needs of the graduate student in agriculture; also for the requirements of students in the agricultural colleges, teachers in agricultural schools, graduates of agricultural schools and colleges, agricultural institute lecturers, and the rapidly increasing number of intelligent men who are daily interesting themselves in the scientific phases of modern farming."

In a historical introduction the author gives in a few pages a summary of the major steps in the scientific development of the use of manures and fertilizers. Then follow chapters dealing with night soil; the dung of farm animals and its preservation; the organisms and fermentation of dung; the practical utilization of manures; sea weeds; guanos; fish, crab, lobster, and similar wastes; common slaughter-house nitrogenous waste products; other miscellaneous nitrogenous substances; the availability of organic nitrogen and factors affecting it; calcium and potassium nitrates; nitrate of soda; ammonium salts and calcium cyanamid; natural phosphatic fertilizers; manufactured phosphates and studies of solubility; potassic fertilizers; the theory and practice of potash fertilization; lime and its relation to soils and fertilizers; liming in its relation to plants; gypsum and waste lime from industries; magnesia as a fertilizer; sodium salts; iron and manganese; and chlorine, sulphur, silica, carbon disulphid, toluene, and other miscellaneous substances.

In the discussion of many important features of the subject the author has drawn freely upon the results of his own well-known investigations relating to plant nutrition and soil requirements at the Rhode Island Experiment Station because, as he observes, "he can speak of these results in a more authoritative way than of work done elsewhere," and because "the work has been, in some respects, of a pioneer character, and has not been duplicated."

Some of the subjects which are perhaps more fully treated than in most text-books of this kind are guano and human excrement (largely historical); seaweed (not, however, dealing with the recent exploitation of Pacific coast seaweeds as a source of potash); the bacterial changes in animal excrements; the relative availability of nitrogenous manures; the relative value (especially cumulative and indirect effects) of nitrates and ammonium salts; the new synthetic nitrogenous fertilizers—calcium cyanamid and calcium nitrate; and the function in soil improvement and plant growth of lime, magnesia, soda, manganese, and various catalytic fertilizers.

The book is well indexed.

Experiments with fertilizers, manure, lime, and floats, C. E. THORNE and E. MOHN (*Ohio Sta. Bul.* 260, pp. 405-448, figs. 5).—This is a report on experiments at the northeastern test farm of the Ohio Station at Strongsville.

"These experiments, which are still in progress, were begun in 1895 on a cold, heavy clay, lying over compact, argillaceous shales. Part of the land had been in pasture for many years before the experiments were begun, and part under tillage.

"Wherever phosphorus has been applied on this land, whether carried in acid phosphate, bone meal, or raw phosphate rock, it has produced a profitable increase of crop.

"Nitrogen and potassium, while increasing the crop, have produced a smaller effect than phosphorus, especially in the earlier years of the work. During more recent years there has been a slowly increasing effect from these elements.

"While nitrate of soda and muriate of potash have been used at a loss, the fact that the largest yields of crops have been harvested only when the fertilizer has carried nitrogen and potassium in some form indicates the necessity of supplying these elements in some cheaper carrier than chemicals.

"For eight years several brands of factory mixed fertilizers were compared with home mixtures of equivalent composition, made of tankage, acid phosphate, and muriate of potash. The outcome of this test was a greater increase of crop from the home mixtures than from the factory mixtures in every case, while the cost of the home mixtures was much less than that of the factory mixtures.

"Acid phosphate and steamed bone meal have been the most effective carriers of phosphorus. Apparently there has been very little difference in effectiveness between the pound of 'available' phosphorus in acid phosphate and the pound of total phosphorus in steamed bone meal.

"Steamed bone meal has been more effective than raw bone meal, a result which may have been due in part to the finer grinding of the steamed meal and in part to the low effect of nitrogenous fertilizers on this soil.

"Raw phosphate rock appears to have been effective in proportion to the 'available' phosphorus contained. When applied at the rate of 2,000 lbs. per acre every five years, raw phosphate rock has produced a greater increase in the cereal crops than raw limestone in twice that quantity. In the earlier experiments clover was benefited by the phosphate rock, but in more recent years the clover has failed on the phosphated land, though growing with increasing luxuriance on that receiving limestone.

"As a direct application to the land, therefore, acid phosphate and steamed bone meal have been found to be more economical sources of phosphorus than raw phosphate rock.

"Lime is as urgently needed on this land as phosphorus, it having become practically impossible to grow clover until lime has been applied, no matter how thoroughly the land was manured or fertilized."

The preservation of cattle manure (*Planters' Chron.*, 8 (1913), No. 43, pp. 550-552).—Comparative tests on a rotation of crops of deep stall manure and manure preserved in pits and heaps with and without addition of loam soil are briefly reported. These indicated that for the shallow-rooted crops the best results were obtained with the manure containing the largest amount of organic matter, the effect being due largely to the mechanical condition of the manure rather than to its relative percentage of fertilizing constituents.

The deep stall manure contained on the basis of dry matter 56.9 per cent of organic matter, the pit manure 45.01 per cent, and ordinary heap manure 38.87 per cent.

The effects of fertilizers other than that of adding plant food, L. L. VAN SLYKE (*Cornell Countryman*, 11 (1913), No. 2, pp. 51-53).—This article discusses briefly certain secondary and subsidiary effects of sodium nitrate, ammonium sulphate, superphosphate, potassium chlorid, and potassium sulphate when applied as fertilizers. These are cited as examples "to illustrate the fact that, in applying commercial fertilizers to the soils, some account must be taken of the effects other than those of supplying plant food. If this is not done, not only may the applied plant food fail to produce the desired effect but even act injuriously."

The nitrogen content of night soil from the city of Florence, N. PASSERINI (*Atti R. Accad. Econ. Agr. Georg. Firenze*, 5. ser., 10 (1913), No. 4^a, pp. 353-360; *Bol. Ist. Agr. Scandicci*, 2. ser., 7 (1913), No. 4, pp. 315-322).—Analyses of a number of samples of both solid and liquid material are reported.

Tests of the agricultural value of the nitrogen of "Poudro", M. DE MOLINARI and O. LIGOT (*Ann. Gembloux*, 23 (1913), No. 11, pp. 537-544, figs. 2).—"Poudro" is a fertilizer prepared from household garbage and contains, according to the analyses reported, from 0.39 to 0.84 per cent of nitrogen and somewhat smaller amounts of phosphoric acid and potash. In pot experiments with oats on clay soil and sand its nitrogen appeared to be quite active as compared with that of ammonium sulphate.

The production of artificial fertilizing materials from the nitrogen of the air, A. BENCKE (*Die Erzeugung künstlicher Düngemittel mit Luftstickstoff. Vienna and Leipsic*, 1913, pp. VII+204, figs. 58).—The various processes proposed for this purpose are fully described and discussed, as is the industrial value of the products.

How can the dusty condition of lime nitrogen be lessened? A. STUTZER (*Deut. Landw. Presse*, 40 (1913), No. 84, pp. 1002, 1003).—It was found that lime nitrogen mixed with from 10 to 15 per cent of ground bog iron ore kept for 7 months in good mechanical condition and without loss of fertilizing value.

On the decrease of available phosphoric acid in mixed fertilizers containing acid phosphate and calcium cyanamid, R. N. BRACKETT ET AL. (*Jour. Indus. and Engin. Chem.*, 5 (1913), No. 11, pp. 933-935).—In the experiments reported in this article it was found that there was a gradual increase of insoluble phosphoric acid in mixtures of cyanamid and acid phosphate. The experience of fertilizer manufacturers and the results of fertilizer inspection indicate the same thing, viz, that the mixing of cyanamid with acid phosphate will injure the fertilizer from the farmer's standpoint, and that if a considerable amount of the cyanamid is used in the mixture the fertilizer will be found on inspection to be decidedly deficient in available phosphoric acid.

Fertilizer analysis, E. A. MITSCHERLICH and W. SIMMERMACHER (*Landw. Jahrb.*, 43 (1912), No. 3, pp. 405-435; *abs. in Jour. Chem. Soc. [London]*, 104 (1913), No. 609, I, p. 812; *Chem. Zentbl.*, 1913, I, No. 18, pp. 1627, 1628).—In experiments with various phosphates on oats not only the yield but the phosphorus content of the crop followed the law of minimum as theoretically formulated by the author. The latter, therefore, proposes that the results of determinations of phosphoric acid soluble in a saturated solution of carbon dioxide be correlated directly with yields and not with the phosphorus content.

The different phosphates behaved very differently. With monocalcium phosphate there was an excess (*luxus*) consumption of phosphorus by the plant which is measured by the water solubility of the phosphate. The saturation concentration of the carbon dioxide solution with phosphate was dependent upon the temperature. The temperature of saturation must be kept as nearly as possible the same as that under which the plants grow in order that comparable results may be obtained. The author adopted 15° C. as most nearly meeting

this requirement. Of course seasonal variations make close approximations in this respect impossible, but the actual differences due to this factor are thought to be comparatively small.

A report on the phosphate fields of South Carolina, W. H. WAGGAMAN (*U. S. Dept. Agr. Bul. 18, pp. 12, pls. 3, fig. 1*).—The history of these deposits is briefly reviewed and their location, extent, character, and exploitation are described. "The phosphate region lies along the coast in a belt extending from the Wando River, in Charleston County, to the Broad River, in Beaufort County. The rock is of Tertiary age and is usually divided into two classes, namely, the land deposits and the river deposits. These classes, however, are practically identical, the latter being merely the former washed into the river beds. . . .

"With the exhaustion of the more accessible deposits and the discovery of higher grade phosphates in Florida and Tennessee, the output from South Carolina has fallen off considerably. River mining has entirely ceased, and only two companies are mining the land rock. The total output in 1911 was 169,156 tons. . . .

"The general opinion has been that the phosphates of South Carolina are practically exhausted. This is far from being the case. There are thousands of acres of rich phosphate land still practically untouched. Although the phosphate on much of this property is covered by a heavy overburden, more efficient mining methods and improved market and transportation conditions would render it all available."

Thomas slag, its preparation and use, J. P. WAGNER (*Monatsber. Gesell. Förd. Wiss., Ackerb. u. Künste Unter-Elsass, 47 (1913), No. 3, pp. 126-168, figs. 27*).—The process of manufacture of Thomas slag is described in some detail, and its use as a fertilizer is discussed.

Analyses of Thomas slag from different sources, H. VON FEELITZEN and I. LUGNER (*Chem. Ztg., 37 (1913), No. 68, pp. 689, 690*).—Analyses of a number of samples of Thomas slag are reported, showing a much smaller content of free lime than is indicated by the older analyses. There was no great variation in the composition of slag from different sources.

Kelp and other sources of potash, F. K. CAMERON (*Jour. Franklin Inst., 176 (1913), No. 4, pp. 347-383, figs. 13*).—This article discusses briefly other sources of potash, but deals in detail with the utilization of the Pacific coast kelps for this purpose. The more important species of kelps from the fertilizer standpoint, the location and extent of the kelp groves, the composition and fertilizing value of kelp, and methods of harvesting and handling the material are described. Data are also given as to the present status and future possibilities of the kelp industry on the Pacific coast.

Lime, B. H. HIRE (*West Virginia Sta. Circ. 6, pp. 16, figs. 3*).—This circular discusses in a popular way the effects of lime on the soil and gives information as to how it may be obtained and used.

On the influence of the ratio of lime to magnesia on plants, O. LOEW (*Jour. Indus. and Engin. Chem., 5 (1913), No. 11, pp. 959, 960*).—This is a reply to an article by Gile and Ageton already noted (*E. S. R., 28, p. 812*).

Is silica an indispensable constituent of plant food? M. LUNDIE (*So. African Jour. Sci., 9 (1913), No. 10, pp. 263-268*).—Earlier investigations on this subject are briefly reviewed and water culture experiments by the author are reported. The results of the latter indicated that silica is not essential as a plant food, but suggested that when deposited in the cell membrane and in the epidermis of the plant it might afford a certain protection against fungus disease (rust).

Commercial fertilizers, J. S. BURD (*California Sta. Bul.* 240, pp. 55).—Analyses and valuations of fertilizers inspected during the year ended June 30, 1913, are reported, and a list of registered fertilizer manufacturers and dealers in California for the year beginning July 1, 1912, is given. It is estimated that the sale of fertilizers in the State during the year ended June 30, 1912, was 50,955 tons. The indications are that the consumption during the year ended June 30, 1913, was much less than this.

AGRICULTURAL BOTANY.

On the chemical organization of the cell, W. RUHLAND (*Biol. Centbl.*, 33 (1913), No. 6, pp. 337-351).—Continuing work noted in a previous report on the permeability of the living plasma membranes (*E. S. R.*, 23, p. 37) the author here discusses the relation of the facts observed to the views of other investigators, a number of which are discussed.

The significance of the character of the electrical charge for the passage of colloids through the plasma membrane, W. RUHLAND (*Ber. Deut. Bot. Gesell.*, 31 (1913), No. 6, pp. 304-310).—Continuing the work noted above, the author states that no difference was established between acid and basic coloring matters as to conditions and rapidity of passage through living plasma membranes. Transpiration rate and electrical character have not been shown to be influential as regards rapidity of passage, and widely different plants show like behavior in these respects. These facts are held to support the author's view regarding the plasma membrane as an ultra-filter.

Investigations on the fermentation of some cyclic series compounds and the formation of the black material of humus, A. PERRIER (*Ann. Sci. Agron.*, 4. ser., 2 (1913), I, Nos. 5, pp. 321-350; 6, pp. 455-470).—The author presents the results of a study on the aerobic fermentation of benzoic, oxybenzoic, and phenic acids, and the rôle of cyclic compounds in the formation of the black coloring matter of manures and humus.

It was found that the cyclic compounds, particularly benzoic acid, which is rather widely distributed in the animal and vegetable kingdom, serve as nutrients for a large number of micro-organisms which are abundant in the soil.

A detailed study of the biochemical phenomena showed that benzoic acid is oxidized by *Bacillus pyocyaneus* and a number of other related organisms in a neutral medium to a black coloring material analogous to that in humus. The formation of this coloring matter is not considered due to tyrosinase, but should be rather compared to that which is produced in the oxidation of polyphenols, notably pyrogallol in an alkaline medium. This would indicate that the oxidation is brought about by the aid of an oxidase, but the author was unable to demonstrate the presence of a diastase associated with the phenomenon.

In the second part of the paper an account is given of an extended study of the formation of the coloring matter of manure and humus, which in every case is attributed to the oxidation in an alkaline medium of cyclic compounds contained in the manure or in plant materials in the process of decomposition.

A brief bibliography is appended.

The necessity of a bacterial association for the development of a myxobacterium, *Chondromyces crocatus*, E. PINOY (*Compt. Rend. Acad. Sci. [Paris]*, 157 (1913), No. 1, pp. 77, 78).—The author concludes from a study of *C. crocatus* that this organism is not able to accomplish its development apart from its association with a particular bacterium which is described and said to be closely allied to *Micrococcus latens*.

A mud sucking device for obtaining soil microflora and microfauna, B. PERFYL'EV (*Izv. Imp. St. Peterb. Bot. Sada (Bul. Jard. Imp. Bot. St. Petersb.)*,

13 (1913), No. 1-2 pp. 47-51, figs. 2).—Figures and a description are given of a convenient and cleanly device for obtaining mud and similar material in bottles for the study of the contained life forms.

Studies in Indian tobaccos.—III, The inheritance of characters in *Nicotiana tabacum*, GABRIELLE L. C. HOWARD (*Mem. Dept. Agr. India, Bot. Ser.*, 6 (1913), No. 3, pp. 25-114, pls. 25, fig. 1).—In a previous paper (*E. S. R.*, 23, p. 537), an account was given of a study of varietal characters and the isolation of pure forms of tobacco. In the present contribution additional data are presented relating to the behavior of different strains in later generations.

In the progress of the investigation it was found that parthenogenesis in *N. tabacum*, under the conditions of the experiment, is negligible. In all characters except height, the F_1 generation is intermediate between the parents. The limits of variation in the F_2 generation have been as great as those of both parents combined or have exceeded these in both directions. Selected variates of the F_2 generation gave cultures which differed in their range of variation from one another, and often from both parents. It was found that while the height of tobacco plants may differ only slightly, the factors on which such height depends may be almost entirely different. The number of leaves per plant was not found to depend on the height of the plant, and was also independent of the environment. A distinct segregation was observed as regards the arrangement of the leaves on the stem. The author states that the most suitable leaves for measurements are those occurring in the center of the plant, and that venation of the leaves is one of the most constant characters of the plant, parental forms having been reisolated in the third and fourth generations.

In conclusion the author summarizes the data, stating that "a study of the characters of *N. tabacum* shows that there is no inherent difference in the mode of inheritance of ordinary qualitative characters (such as the color of the corolla) and of those characters connected with the size of the organs which are subject to fluctuating variability. All the results obtained can be explained by the Mendelian assumption of segregation of characters, combined with the hypothesis that in connection with each character a large number of factors exist, each of which can be inherited independently."

The flowering of *Geranium robertianum* under the influence of various physical conditions, R. STÄGER (*Bot. Centbl., Beihefte*, 30 (1913), 1. Abt., No. 1, pp. 1-16; *abs. in Rev. Sci. [Paris]*, 51 (1913), II, No. 8, p. 245).—The flowering of this plant has attracted much attention on account of the apparent variation in its adaptation for pollination. The author claims that two types of flowers are produced, depending upon the climatic conditions at the time, protandrous flowers if the weather is fine and the temperature fairly high, and protogynous flowers in cooler and more humid surroundings. From 1 to 3 days are required for the pollination of the flowers. A high temperature and dry air favor precocious pollination, while low temperature and moist conditions retard it and favor the greater growth of the styles, resulting in a protogynous condition.

The relation between tuberization and infestation of the roots of *Spiranthes autumnalis* by endophytic fungi, C. BEAU (*Compt. Rend. Acad. Sci. [Paris]*, 157 (1913), No. 13, pp. 512-515).—A study was made of *S. autumnalis* in the light of the investigations of Bernard (*E. S. R.*, 14, p. 635; 18, p. 1031). The author found that while this orchid, which produces new tuberous organs each year, requires the presence of endophytic fungi to begin the development of its tubers, in a mature state it is independent of the symbiotic relationship.

Influence of radioactivity on vegetation, M. VACHER (*Bul. Soc. Nat. Agr. France*, 73 (1913), No. 5, pp. 357-372).—Discussing the results obtained from experimental work done by Petit and Ancelin (*E. S. R.*, 20, p. 326), Stoklasa (*E. S. R.*, 23, p. 731), and others, the authors state that radioactivity appears

to favor nitrification in soils and foliar development of plants. Soil naturally or artificially supplied with nitrogen, phosphoric acid, potassium, and lime is always improved by the presence, even in minute quantity, of radioactive substance.

Some recent studies on germination, E. LEHMANN (*Ztschr. Bot.*, 5 (1913), No. 5, pp. 365-377).—This is a brief account of studies on the factors influencing germination, with references to several recent articles.

Germination of potato, E. COUVREUR (*Compt. Rend. Soc. Biol. [Paris]*, 74 (1913), No. 23, pp. 1315-1317).—As the result of a study of potatoes during germination, the author states that both maltose and a ferment are present from the beginning of that process, the latter being active in all tissues after a certain age is attained. It is stated that analogous facts have been noted in case of beans and chestnuts, and that publication of these is contemplated.

Transpiration and osmotic pressure in mangroves, F. C. VON FABER (*Ber. Deut. Bot. Gesell.*, 31 (1913), No. 6, pp. 277-281).—The author states, as the result of his studies, that the high osmotic pressure in the cells of mangroves is due to the storing of salts and other osmotically important substances, in some cases probably tannic acid. Such accumulation is not a function of transpiration but a specific character of the plant, as held by Fitting (E. S. R., 25, p. 430) to be true of desert plants.

The distribution of temperature in living plants, G. DUPONT (*Rev. Gén. Sci.*, 24 (1913), No. 11, pp. 418-425, figs. 15).—This is essentially the same article as previously reported (E. S. R., 28, p. 126).

Wind and the plant world; a study, G. H. KROLL (*Bot. Centbl., Beihefte*, 30 (1913), 1. Abt., No. 1, pp. 122-140).—This is a discussion of the direct and the indirect influence of wind on plant life in or near large bodies of water or on continental areas, including in the former case wave action, nutritive or noxious solutions, seed transportation, etc., and in the latter case injury in exposed situations through breakage, increased transpiration, etc., or furtherance through such agents as seed distribution and rain production.

The presence and persistence of hydrocyanic acid in some grains in hot regions, L. RAYBAUD (*Compt. Rend. Soc. Biol. [Paris]*, 74 (1913), No. 19, pp. 1116, 1117).—It is stated that studies with 26 varieties of sorghum in north and west Africa and India, and 2 species of Eleusine in India, have shown that even under conditions of irrigation, etc., unfavorable to its accumulation, hydrocyanic acid occurs in considerable quantity in the young plants and that later it migrates to the higher portions where it may be found until the maturation of the grain, after which it slowly disappears. This result is regarded as corroborative of the conclusion reached by Treub (E. S. R., 23, p. 330) regarding the rôle played by hydrocyanic acid in plant growth.

Demonstration and localization of nitrates and nitrites in plants, R. KLEIN (*Bot. Centbl., Beihefte*, 30 (1913), 1. Abt., No. 1, pp. 141-166, pls. 2).—The author reports that nitric salts are usually found in herbaceous plants. Nitrites were not found in the sap of Fuchsia as exuded under root pressure, but they develop apparently as the result of bacterial and fungal activity. They do not appear ordinarily in underground portions of *Sagittaria sagittifolia* and *Pisum*. They are demonstrable in potato tubers only before sprouting, but they are found in expressed leaf sap of *Erythrina* and in root nodules of some Leguminosæ, being quite abundant in case of *Phaseolus multiflorus*.

A bibliography is given.

On the alleged connection between assimilation of nitric acid and deposit of manganese in plants, ELSA HOUTERMANS (*Sitzber. K. Akad. Wiss. [Vienna]*, *Math. Naturw. Kl.*, 121 (1912), I, No. 8, pp. 801-831, pls. 2).—The author, giving tabulated results of some recent investigations, states that she was unable

to confirm the conclusions of Acqua (E. S. R., 29, p. 323), which are to the effect that the points of deposit of certain metallic ions in growing regions are also points of utilization of the acid portions of the nutritive compounds involved.

In case of wheat and beans the deposit of manganese occurred when this cation was united with an indifferent or injurious anion, if nitrate in other and harmless form was supplied to the plant, the rate and amount of manganese deposit proving independent of nitrogen assimilation. The blackening was independent of light admission and is probably explainable as related to enzymatic processes. The deposit of manganese dioxid in case of *Elodea canadensis* occurred only in light and apparently was not due in this case to nitrogen assimilation. The deposit of manganese failed only when the endodermis was continuous and unwounded, or when the epidermis acted as a chemical filter. On employment of low concentrations of toxic substances or of very concentrated nutritive media, the inner endodermis thickened in case of all plants studied which possessed uninterrupted endodermis. Distilled water had the same effect on the endodermis as did a weak poison, while various strong poisons able to check growth caused no such thickening of endodermis. Potassium permanganate was reduced commonly in the outer layers of cells, otherwise always in the third or fourth layer, never reaching the vascular bundle cylinder proper.

The significance of deposits occurring in plants cultivated in solutions of manganese salts, C. ACQUA (*Ann. Bot. [Rome]*, 11 (1913), No. 3, pp. 467-471).—This is a critical note in reply to the above article.

On the presence of deposits in plant tissues due to culture in manganese nitrate solution, EVA ROSELLI (*Ann. Bot. [Rome]*, 11 (1913), No. 3, pp. 459-465).—Results obtained from the study of 11 plants covering a wide range of forms are said to confirm the conclusions arrived at by Acqua (E. S. R., 29, p. 323), but to be at variance with those reached by Houtermans noted on page 30. It is stated that a close relation appears to exist between the deposit of cations and the changes occurring in newly formed tissue.

The influence of calcium, magnesium, and potassium nitrates upon the toxicity of certain heavy metals toward fungus spores, L. A. HAWKINS (*Physiol. Researches*, 1 (1913), No. 2, pp. 57-92, figs. 6).—The results of a study of the influence of one salt in altering the toxic effect of another upon fungus spores are given. The salts employed were the nitrates of copper, lead, zinc, nickel, and aluminum used alone and in combination with the nitrates of calcium, magnesium, and potassium.

It was found that the effect of a toxic salt on the germination of the conidia of *Glomerella cingulata* might be influenced by the addition to the medium of calcium, magnesium, or potassium nitrate. This effect, it is claimed, is not due to a depression of ionization of the toxic salt nor to the formation of undissociated double salts, but the influence of calcium upon the toxicity of the salts of the heavy metals employed is to be referred to an effect of the calcium nitrate on the spore or on the contained protoplasm.

A bibliography is appended.

Experiments on the action of sodium sulphate as affecting growth of plants, E. HASELHOFF (*Landw. Jahrb.*, 44 (1913), No. 4, pp. 641-650).—Discussing the results of former investigations on the effect of flue dust (E. S. R., 19, p. 1130; 21, p. 128) and in connection therewith his more recent studies regarding the action of sodium sulphate on growing beans, barley, and Indian corn, the author claims that in spite of individual variations it is safe to conclude that sodium sulphate in 0.05 per cent strength, while sometimes hastening development, usually decreases the total growth of the plants studied as estimated by weight, the growth in length proving unreliable in this respect. The soil-culture studies indicated an injurious effect of sodium sulphate on

plant growth, also that in the crop an increase of sodium and of sulphuric acid corresponded to an increase of sodium sulphate in the soil or the nutritive solution employed.

The distribution of atmospheric impurities in the neighborhood of an industrial city, C. CROWTHER and D. W. STEUART (*Jour. Agr. Sci. [England]*, 5 (1913), No. 4, pp. 391-408, figs. 2).—In continuation of a previous report (E. S. R., 25, p. 434) an account is given of an examination of the atmosphere in the country surrounding the city to a distance of about 7 miles.

The observations here reported show that no general effect upon the opening of the buds could be detected. By the end of May smoke damage began to be evident within 2 miles of the center of the city by the appearance on the leaves of sycamores and limes of characteristic brown blotches. During June the conditions, so far as the leaves were concerned, became considerably worse, and in the case of many trees, as shown by the examination of cross sections, there was very little annual growth. Criticisms having been made of previous observations relating to the clogging of the stomata, microscopical examinations were made of a number of evergreen leaves which confirmed in the main the previous statements.

Summarizing the results observed, the authors state that the sulphur content of the rain falling at a given station affords a fairly reliable diagnosis of the degree of pollution of the atmosphere by smoke providing the observations be prolonged over several months. The rain analyses show further that appreciable smoke pollution remains throughout the agricultural area at distances of 7 miles from the city, the rate of improvement being slower in the direction of the prevailing winds than in other directions.

The influence of tar, particularly that of tarred streets, upon vegetation, P. CLAUSSEN (*Arb. K. Biol. Anst. Land. u. Forstw.*, 8 (1913), No. 5, pp. 493-514, pls. 2, figs. 8).—As the result of experimentation with 5 ornamental flowering herbs, 2 firs, and a spruce, exposed to fumes of several commercial tars in air or soil, the author states that the various kinds of tar sold for highway building purposes differ widely as to effect on the plants; that the injurious effects of tar vapors are closely related to their concentration, this depending upon volatility and temperature; and that species of plants differ widely as to their sensitivity to such vapors.

It is recommended that the plants be placed at a safe distance from the tarred surfaces; that careful tests be made of tars intended for such purposes; that the practice of heating the tar in the neighborhood of the plants be avoided, also that as low temperatures as are practical be employed; and that this work be done so far as possible when the foliage is off the trees, and by no means during the very early stages of its formation.

FIELD CROPS.

Study of farm practice versus field experiments, W. J. SPILLMAN (*Proc. Soc. Prom. Agr. Sci.*, 33 (1912), pp. 103-113, figs. 3).—This article has been previously noted (E. S. R., 28, p. 198).

Determination of probable error in field experiments, HARNOTH (*Mitt. Deut. Landw. Gesell.*, 28 (1913), Nos. 5, pp. 70-73, fig. 1; 6, pp. 87-90; 7, pp. 105-107).—This paper includes discussions of methods of reckoning the variation of each check plot of a series from the mean of their yields. For this

purpose Gauss' formula, $R = \pm \frac{0.845[lv]}{\sqrt{n[n-1]}}$ is used, in which lv is the sum of the

variations regardless of signs, n the number of observations, and 0.845 is a

constant. Applications of this formula to various fertilizer experiments are presented.

Determinations of probable errors in field experiments, I. ALEXANDROWITSCH (*Mitt. Deut. Landw. Gesell.*, 28 (1913), No. 18, pp. 268-271).—This is a critical discussion of the above.

Determination of probable errors in field experiments, HARNOTH (*Mitt. Deut. Landw. Gesell.*, 28 (1913), No. 19, pp. 281-283).—This is a discussion of the above two articles.

Methods of testing varieties, E. KOSTECKI (*Trudy Būro Prikl. Bot. (Bul. Angew. Bot.)*, 5 (1912), No. 7, pp. 177-204, figs. 3).—The first part of this article discusses field methods and the results obtained. The second part considers sources of error in computing and comparing results. The probable error to be reckoned with in an experiment (e) was obtained by extracting the square root of the sum of the square of the apparent errors (v) divided by the number of observations (n) minus 1. The formula is expressed as $e = \sqrt{\frac{\sum v^2}{n-1}}$.

Variety tests of field crops, O. LEMMERMANN ET AL. (*Landw. Jahrb.*, 42 (1912), No. 5, pp. 679-699).—Results are given of tests of numerous varieties of winter rye, winter and spring wheat, oats, field beets, field carrots, and alfalfa. Data are presented in tabular form including meteorological observations.

Electroculture, J. ESCARD (*Rev. Gén. Sci.*, 24 (1913), No. 8, pp. 302-309, figs. 5).—The author gives a survey of the work done along this line since its inception about 1845, including methods and general results.

Observations on some new methods of growing cereals, T. REMY and E. KREPLIN (*Landw. Jahrb.*, 42 (1912), No. 2, pp. 597-629, fig. 1).—This work gives the results of observations on the effect of transplanting to different depths, hilling up transplanted plants, seeding in furrows, and hilling up plants in ordinary field culture, with winter rye, winter wheat, spring wheat, barley, and oats, with special reference to the Demtschinsky method (*E. S. R.*, 27, p. 232; 28, p. 632).

It is noted that great care seemed necessary in seeding with less than the customary quantity of seed, although when this could be done the improved vigor and size of the individual plants commended this practice.

With winter wheat, winter rye, and spring barley the planting in furrows which were later filled in with soil was slightly favorable, but with spring wheat and oats the injury caused by the frit fly was more marked when the soil came higher up on the stem than normal.

All of the cereals showed improved growth by the Demtschinsky method, but spring cereals were more readily damaged by the frit fly. The hand labor involved in this transplanting method made it impractical as a field method.

Dominant and recessive characters in barley and oat hybrids, R. W. THATCHER (*Proc. Soc. Prom. Agr. Sci.*, 33 (1912), pp. 37-50).—These experiments, which were conducted at the Washington Experiment Station, have shown that "the percentages of proportionate distribution of the various groups, when computed on the basis of spring types, show clearly the dominance of hooded over bearded, and of 2-rowed over 6-rowed, characters as noted in preceding crosses. The distribution of 2-rowed, hybrid, and 6-rowed types in both the hooded and bearded classes, showing the characteristic 1:2:1 Mendelian ratio and the 26.6 per cent bearded types as compared with 73.4 per cent hooded types, furnishes confirmatory evidence that this is a unit pair character."

With oats it is noted that no definite conclusions could be drawn from the results of crossing with Chinese Hull-less. "The appearance of black kernels in the progeny from a cross of 2 white-kernelled parents indicates heterozygosity in 1 or both parent strains, which, however, does not seem to have a consistent effect in the various crosses. . . . In one of the crosses there is evidence of a Mendelian ratio between the hulled and hull-less character, but in others such a proportional distribution is wholly lacking."

[Fertilizer experiments], A. W. K. DE JONG (*Dept. Landb., Nijv. en Handel [Dutch East Indies], Meded. Agr. Chem. Lab., 1913, No. 3, pp. 1-49*).—In fertilizer experiments with rice, cassava, soy beans, maize, and peanuts, better results were obtained with maize with double superphosphate than with Thomas slag or guano. The results with bone meal were even better than with the double phosphate, while barnyard manure seemed to lack the phosphorous to produce the maximum yields. Cassava responded best to nitrogen. Peanuts were apparently benefited by barnyard manure plus bone meal. In general the phosphates seemed to give the best results.

Progress report of cooperative irrigation experiments at California University Farm, Davis, California, 1909-1912, S. H. BECKETT (*U. S. Dept. Agr. Bul. 10, pp. 21, figs. 7*).—These experiments were for the purpose of determining the water requirements of various standard crops.

With alfalfa, the results indicated that in open, well-drained soil, typical of that found in the floor of the Sacramento Valley, the general tendency is toward an increase in yield of alfalfa with the increased amounts of water applied up to at least 48 in.; and for such conditions as are found on the university farm the limit beyond which the increase in yield will not pay for increased cost of applying the water is in the neighborhood of 30 in.

"Without irrigation spring-sown alfalfa is uncertain in Sacramento Valley, and under conditions of normal rainfall and moderate climate not more than one-half of the stand can be expected to survive through the summer. Heavy spring irrigations, when followed by long periods throughout the summer without water, did not benefit alfalfa. Examination of the root growth under these conditions shows that water applied to the little plants in the early spring produces a root growth outwardly along the surface of the soil rather than downward, and when this is followed by long dry periods, the soil drying out leaves the young plant stranded above the moisture zone. Far better results were obtained by delaying irrigation until the root growth was well established, and even until the little plants seemed to be stunted and suffering for moisture. . . . Late and very late summer irrigations tend to produce sturdier plants and heavier yields the following summer. After the root growth is well established, the growth may then be forced by frequent and, if the soil will stand it, heavy irrigations."

In studying the best time to irrigate alfalfa it was found that 2 applications between cuttings gave larger yields and kept the plants in better condition than when the same amount of water was applied in one irrigation, either just before or just after each cutting, but it was concluded that the extra yield was not large enough to make it a profitable method.

In the case of barley, 3 years of irrigation experiments showed that the application of water always gave a profit and that a late application gave better yields than an early one. The results of irrigating maize for 1910 and 1911 showed little advantage due to irrigation, although in 1910 there was a slight profit with 1 and 2 applications of water. The cost of irrigating from 1 to 3 times during these 2 seasons ranged from \$1.40 to \$3.90 per acre with the furrow method. Similar results were obtained with White Durra sorghum, but

it is noted that with both these crops irrigation can be made to pay if great care and intelligence be exercised.

The yields of oats and wheat following alfalfa were produced at a profit by irrigating in 1912, the grain values ranging from \$18.15 to \$30.60, as compared with \$6.53 and \$8.40 without irrigation. Sugar beets following alfalfa in 1912 gave increased yields with an increased water supply, while the sugar content slightly decreased. Better yields were obtained under irrigation with early than with late seeding. With the early seeding the crop had a value of \$54.25 when not irrigated, while with 2 irrigations it was \$87.50.

The reseeding of depleted grazing lands to cultivated forage plants, A. W. SAMPSON (*U. S. Dept. Agr. Bul. 4, pp. 34, pls. 8, figs. 4*).—In this bulletin the range problem and investigations of these problems in the National Forests are briefly discussed, and studies reported continuing previous work (E. S. R., 22, p. 35). The following grasses were used in over 500 experiments in 1909, 1910, and 1911; Hard fescue (*Festuca duriuscula*), broom grass (*Andropogon* sp.), Canada blue grass (*Poa compressa*), slender wheat grass (*Agropyron tenerum*), blue grama grass (*Bouteloua oligostachya*), Italian rye grass (*Lolium italicum*), smooth or Hungarian brome (*Bromus inermis*), Kentucky blue grass (*P. pratensis*), mesquite (*Hilaria cenchroides*), orchard grass (*Dactylis glomerata*), perennial rye grass (*L. perenne*), redtop (*Argostis alba*), tall meadow oat grass (*Arrhenatherum elatius*), and timothy (*Phleum pratense*). The following nongrasses were also used: Alfalfa (*Medicago sativa*), alfilaria (*Erodium cicutarium*), alsike clover (*Trifolium hybridum*), bur clover (*M. denticulata*), Japanese clover (*Lespedeza striata*), red clover (*T. pratense*), Australian saltbush (*Atriplex semibaccata*), and white clover (*T. repens*). By far the best results were secured with timothy, 64.37 per cent being at least partially successful. Smooth brome grass and perennial rye grass ranked next. Very few of the nongrasses yielded satisfactory returns, the best results being with white and alsike clovers and alfilaria.

In studying the different cultural methods employed with timothy, redtop, and Kentucky blue grass, a light brushing to cover the seed was found to give better results than tramping with sheep, or no treatment. The altitude of the area planted formed an important element in reseeding. The yield at 4,800 ft. was about 4 times that at 7,800 ft., and the difference in the viability of the seed produced was even greater. Autumn seeding proved superior to spring seeding. The cost of reseeding with a mixture of timothy, Kentucky blue grass, and redtop ranged from 80 cts. to \$3.50 per acre, but usually averaged about \$1.50.

"The reseeding investigations show that the returns secured from sowing suitable cultivated forage plants on certain ranges fully warrant the expense. It is not to be presumed, however, that all overgrazed ranges can be successfully reseeded to cultivated plants. On the contrary, it is unquestionably true that existing conditions in the major portion of the native grazing lands are antagonistic to the establishment of introduced plants. This is due primarily to one or all of 3 conditions: Excessive elevation, poor soil, coupled with insufficient moisture, or too much and too aggressive native vegetation."

A note on two textile plants from the Belgian Kongo, E. MESTDACH (*Bul. Agr. Congo Belge, 3 (1912), No. 3, pp. 619, 620, figs. 2; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 12, pp. 2639, 2640*).—Two new fiber plants, akonge (*Triumfetta semitriloba*) and losa (*Manniophyton africanum*), are here described.

Alfalfa seed production, P. K. BLINN (*Colorado Sta. Bul. 191, pp. 3-16, figs. 13*).—This bulletin is a report of progress in work which was instituted

because of the general decrease in production and yield of alfalfa seed of recent years in Colorado. It discusses the following factors as influencing seed production: Vegetative growth, moisture supply, climatic conditions, insects, and diseases. It is noted that continued irrigation for a long series of years has so influenced the subsoil moisture content as to make it unfavorable to seed production. The methods which were tried to improve the seed-producing characters of alfalfa were seed selection, row cultivation, and control of moisture by light row irrigation, all of which proved beneficial.

Alfalfa management in Iowa, H. D. HUGHES (*Iowa Sta. Bul.* 137, pp. 72, figs. 33).—This bulletin gives directions and suggestions for the production of alfalfa on the various soil types of the State. Reports are given of the experiences of practical farmers in all parts of the State, covering 1,016 alfalfa seedings, of which only 12.7 per cent were classed as failures. The most successful results were reported from Missouri loess and moraine soils, and the greatest number of failures on the Iowa drift and the southern Iowa loess areas. Some of the factors which seemed to be responsible for the failures were lack of proper drainage, necessary bacteria, sufficient plant food, or sufficient moisture to germinate the seed; too heavy or compact soil; young seedlings smothered by weeds and by nurse crops; seeding too deep; a packed surface; poor seed; insect pests; and fungus diseases.

Special note is made of the need of sufficient plant food in the soil at seeding, and of liberally applying barnyard manure on these soils.

Experiments with Turkestan alfalfa in Hungary, J. GYARFAS (*Kiserlet. Közlem.*, 15 (1912), No. 2, pp. 191-209).—Trials of Turkestan alfalfa in various localities showed it to be much inferior to the native alfalfa in drought and frost resistance, and vegetative energy. It also had a much shorter vegetative period, which allowed the growth of weeds and grasses.

A new two-rowed winter barley, D. NEUMANN (*Wehnschr. Brau.*, 29 (1912), No. 37, pp. 526-528, figs. 3).—Through crossing a 4-rowed Mammoth winter barley with a 2-rowed summer barley that had been artificially carried through the winter, a hardy 2-rowed winter barley resulted. By the application of Mendel's law this variety proved stable. It produced well, and was a product of excellent brewing qualities.

A mutation in a pure line of *Hordeum distichum*, L. L. KIESSLING (*Ztschr. Induktive Abstam. u. Vererbungslehre*, 8 (1912), No. 1-2, pp. 48-78).—This gives in detail the characteristics of a barley that appeared in a Bavarian variety, and is considered a mutation.

Variation studies in brome grass, A. KEYSER (*Colorado Sta. Bul.* 190, pp. 3-20, figs. 19).—This bulletin reports the progress of work in studying the strains of awnless brome grass (*Bromus inermis*) which have been collected at the station and which seem especially well adapted to Colorado conditions. There are now under observation 121 strains of this grass, and these show a wide range of individuality in habits of growth and coloration. Variations occur in tillering habit, height of leaf mass, total height of plant, and vigor of stolonification, while the colors range from bright yellow green to a very dark green. Most of these types bred true from seed, but the progeny of some showed wide variation. It was shown that this grass could be propagated vegetatively.

On the presence of hydrocyanic acid in white clover, M. MIRANDE (*Compt. Rend. Acad. Sci. [Paris]*, 155 (1912), No. 15, pp. 651-653; *abs. in Internat. Inst. Agr. [Rome]*, *Bul. Bur. Agr. Intel. and Plant Diseases*, 3 (1912), No. 12, p. 2637).—Methods are described by which hydrocyanic acid was discovered in white clover (*Trifolium repens*).

Silver King.—A corn for northern Iowa, H. D. HUGHES (*Iowa Sta. Bul.* 138, pp. 75-95, figs. 11).—This bulletin gives the development and early history of Silver King corn and sets forth its exceptional value for cultivation in northern Iowa. Records obtained from growers in Wisconsin, covering a period of 5 years, show an average yield of 59.2 bu. per acre, which is an average of 10.9 bu. more than other varieties. This pedigreed corn has been produced at the Iowa Station and about 150 bu. will be distributed among farmers of northern Iowa.

Corn culture in North Carolina, J. L. BURGESS (*Bul. N. C. Dept. Agr.*, 33 (1912), No. 6, Sup., pp. 34).—This bulletin discusses the black, gray, red, and mountain soils of the State in their connection with corn production, green manuring, conservation of moisture, selection and preparation of the seed, planting, cultivating and harvesting, rotations, corn judging, and varieties.

In the variety tests those giving the best results in the coastal plains were Cocke Prolific, Biggs Seven-ear, Southern Beauty, and Hickory King; and in the Piedmont section, Weekly Improved, Southern Beauty, and Cocke Prolific.

Notes on corn growing in Guam, J. B. THOMPSON (*Guam Sta. Rpt.* 1912, pp. 22-24).—The primitive methods of planting and harvesting corn followed by the natives in Guam are described. It is noted that a yield of 27.75 bu. per acre was obtained at the station, which was better than the average crop grown in Guam.

Notes are given on variety tests that include over 40 varieties of widely varying types originating in India, Ceylon, Burma, Formosa, Ecuador, and Colombia. The small-grained types from southern Asia required from 200 to 220 kernels to weigh 1 oz. while a variety from Ecuador required only 55 kernels. No. 576, a variety from the island of St. Vincent, is noted as having characteristics, notably early maturity, making it especially suited to Guam conditions.

Twelfth annual report of the Indiana Corn Growers' Association, edited by G. I. CHRISTIE (*Ann. Rpt. Ind. Corn Growers' Assoc.*, 12 (1912), pp. 94, figs. 22).—This report includes addresses on alfalfa by A. P. Grout, A. T. Wiancko, J. N. Dyer, and M. Douglas, on corn by P. E. Goodrich and D. F. Maish, and on vetch by M. L. Fisher.

Fourth annual report of the Ontario Corn Growers' Association, J. S. DUFF (*Ann. Rpt. Ontario Corn Growers' Assoc.*, 1911, pp. 34, figs. 16).—This includes addresses on corn growing for profit, silage feeding, the improvement of the corn crop, and alfalfa as a soil builder.

Rubelzul cotton: A new species of Gossypium from Guatemala, F. L. LEWTON (*Smithsn. Misc. Collect.*, 60 (1912), No. 4, pp. 2, pls. 2).—This is a description of *Gossypium irenæum*, found a few miles from Senahú in Alta Verapaz, Guatemala. Its most prominent feature is the remarkable development of the calyx, which reaches proportions not known in any other species.

The cotton of the Hopi Indians: A new species of Gossypium, F. L. LEWTON (*Smithsn. Misc. Collect.*, 60 (1912), No. 6, pp. 10, pls. 5).—This publication gives an account of the history and a technical description of *Gossypium hopi* n. sp. and its uses by the Pima and Hopi Indians.

Experiments on the retting of flax, M. RINGELMANN (*Bul. Mens. Off. Renseign. Agr.* [Paris], 11 (1912), No. 9, pp. 1175-1182; abs. in *Internat. Inst. Agr.* [Rome], *Bul. Bur. Agr. Intel. and Plant Diseases*, 3 (1912), No. 12, pp. 2638, 2639).—A bacteriological process is described, by means of which the retting of flax may be carried on in severe winter weather with good results.

Potassium fertilizer for hops, D. NEUMANN (*Wchnschr. Brau.*, 29 (1912), Nos. 48, pp. 679-682; 49, pp. 691-694).—In 12 cooperative experiments the

average increase in yield was from 20 to 30 per cent after the use of potash, but the effect on the quality of the product was doubtful.

Seed varieties of *Lupinus angustifolius* and *L. luteus*, B. KAJANUS (*Ztschr. Induktive Abstam. u. Vererbungslehre*, 7 (1912), No. 3-4, pp. 235-239, pl. 1).—The author describes his method of separation by color marking on the seeds from yellows and blues. Five types of *L. angustifolius* and 3 of *L. luteus* were segregated and bred true. It was noted that black was dominant over normal colors.

African manioc, HENRY, YVES, and P. AMMANN (*Agr. Prat. Pays Chauds*, 12 (1912), No. 110, pp. 353-368, figs. 3; abs. in *Internat. Inst. Agr. [Rome]*, *Bul. Bur. Agr. Intel. and Plant Diseases*, 3 (1912), No. 8, pp. 1769-1771).—This article describes the cultivation of this root crop and the manufacture of its products, flour, glucose, and alcohol.

Vegetative experiments with 88 varieties of oats, G. SCHNEIDER (*Landw. Jahrb.*, 42 (1912), No. 5, pp. 767-833, pl. 1, figs. 20).—In this work the root systems were especially studied as a factor bearing directly upon crop production.

The above ground parts ranged from 18.1 to 54.3 per cent of the root weight, averaging 29.9 per cent at the time of heading and from 10.6 to 28.3 per cent at harvest time, with an average at the latter period of 17.3 per cent. It is noted that the largest yield of grain was not due to more rapid development in germinating, growing, or maturing, or to a longer vegetative period, but to the large functioning capacity of the variety. The early ripening varieties as a rule gave better yields than the late. The percentage of glume to kernels followed inversely the functioning ability of the root and the length of the vegetative period. The larger the spikelet and the higher it was placed on the panicle the heavier as a rule were its kernels found to be.

A study of the weight of the differently placed kernels on the panicle showed those on the base of the spikelet to be the lightest. The average relation of the outer kernel to the inner on the spikelet was as 100:66.4, and to the middle as 100:30.9. The inner and middle kernels were never found to have awns.

A bibliography is appended.

Breeding and seed production of the Fichtel Mountain oats, RAUM (*Landw. Jahrb. Bayern*, 2 (1912), No. 11, pp. 841-940, figs. 14).—This gives the history, description, and methods employed since 1895 in the breeding of this variety of oats.

Wild plantain fiber from India (*Bul. Imp. Inst. [So. Kensington]*, 10 (1912), No. 4, pp. 536, 537).—It is noted that a strong fiber from 4 ft. to 5 ft. 6 in. in length was manufactured from a species of the wild plantain.

Variety [and manurial] tests of potatoes, A. L. DACY (*West Virginia Sta. Rpt.* 1912, pp. 31-54, figs. 3).—This paper records results of variety and fertilizer tests of potatoes conducted at Reedsville, Long Reach, Terra Alta, Letart, and Salama. This work was begun in 1905 and continued with more or less irregularity through 1912.

The average yield of merchantable tubers of the best 10 varieties for the 7 years' trial ranged from 91.5 to 116.8 bu. per acre. The effect of altitude was noted and 7 varieties are named and recommended for high altitudes. Twenty-two varieties are described and typical tubers of 35 varieties are pictured.

As results of the fertilizer tests it is noted that "in amounts up to 500 lbs. per acre it does not pay to apply even a high-grade fertilizer broadcast; that the same amount (500 lbs.) applied in the furrow at planting time produces a very profitable increase in the crop . . . and that in most seasons it is profitable to apply 1,000 lbs. to the acre, putting 500 lbs. in the furrow and applying 500 broadcast."

Pointers on the growing and selection of types of eating potatoes, W. SCHIFTAN (*Illus. Landw. Ztg.*, 33 (1913), No. 14, pp. 111, 112, figs. 7).—In this article 7 types of eating potatoes are described and illustrated and their characteristics discussed. A distinction is made between these types and those grown for brewing or the manufacture of alcohol, starch, etc.

Experiments in the defoliation of sugar beets, F. STROHMER, H. BRIEM, and O. FALLADA (*Österr. Ungar. Ztschr. Zuckerindus. u. Landw.*, 41 (1912), No. 2, pp. 228-240).—This reports a series of experiments in which the yield and sugar content of beets from which the first 2 rows and the first 3 rows of leaves were removed at 3 stages of development, August, September, and October, were compared with those from normally developed plants. In each case the decrease in both sugar content and total yield was in proportion to the quantity of leaves removed. Tabulated analyses of the roots of the several series are given.

Small beet seed, H. BRIEM (*Bl. Zuckerrübenbau*, 19 (1912), No. 12, pp. 185-187).—An article in which the author discusses the value of color, odor, and size of the beet seed, and points to investigations showing that small seeds are not inferior to large ones.

The size of the seed ball of beets, H. PLAHN-APPIANI (*Bl. Zuckerrübenbau*, 19 (1912), No. 17, pp. 265-267).—This is a discussion with citations showing the equal value of large and small seed balls in beet production.

The value of bees to seed beet growing, E. VASILIEFF (*Bl. Zuckerrübenbau*, 19 (1912), No. 10, p. 155; *abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases*, 3 (1912), No. 8, p. 1773).—This article describes the important part bees play in the production of beet seeds.

The manuring of sugar cane at Samalkota Agricultural Station, 1902-1912, G. R. HILSON (*Dept. Agr. Madras Bul.* 66, 1913, pp. 8).—This work shows that on the Delta lands commercial fertilizers are not to be recommended, and that with the price of castor-cake about 4 times that of margosa and pungam cake, the latter is the more economical manure. The yields ranged from 2,767 to 7,167 lbs. raw sugar per acre.

The culture of flue-cured tobacco, E. H. MATHEWSON (*U. S. Dept. Agr. Bul.* 16, pp. 36, figs. 12).—In this bulletin the author has outlined the Old Belt and the New Belt sections for the cultivation of this class of tobacco, and has given a historical sketch leading up to the present time methods of flue-curing tobacco. In describing methods of cultivation, the importance of humus in the soil is noted, and it is stated that the humus may be obtained by plowing under timothy and redtop sod. Other crops mentioned in this connection are oats, wheat, cotton, peanuts, sweet potatoes, corn, and cowpeas, the legumes of which may be pastured off with hogs. Various methods of fertilizing, including the use of barnyard manure and lime, are discussed, and formulas for both sections are presented. Further discussions include varieties, selection and care of plants, preparation and care of the seed bed, comparison of early and late planting, transplanting, cultivation, diseases, insect enemies, topping and suckering, harvesting, and curing and handling. Descriptions are given of curing barns and storage houses.

The entire cost of producing and marketing flue-cured tobacco is estimated at from 6 to 10 cts. per pound.

The Utelo, a plant with oleaginous seeds, E. MESTDAGH (*Bul. Agr. Congo Belge*, 3 (1912), No. 3, pp. 645, 646, fig. 1; *abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases*, 3 (1912), No. 12, pp. 2640, 2641).—A cucurbit native to the Belgian Congo, from the seed of which oil may be extracted, is described, as is also the aboriginal method of manufacture.

On the selection of a type of wheat resistant to severe winters, V. KOLKUNOV (*Khoztaistvo* 7 (1913), No. 36, pp. 1161-1167; *abs. in Internat. Inst. Agr. [Rome]*, *Bul. Bur. Agr. Intel. and Plant Diseases*, 3 (1912), No. 12, pp. 2631-2634).—In subjecting numerous varieties of growing wheat to low temperatures and excessive coverings of snow, the xerophytic varieties seemed the most hardy.

Portuguese varieties of wheat and their improvement, O. KLEIN (*Landw. Jahrb.*, 42 (1912), No. 2, pp. 331-364, pls. 8).—This article gives results of trials of some foreign as well as domestic varieties conducted at Lisbon.

It was found that in general seeding with the drill at the rate of 15 kernels per square meter, or broadcast from 200 to 250 kernels per square meter gave the best results.

Complete chemical analyses and yields per hectare of the grain and straw are given for 30 varieties, with botanical descriptions, notes, etc., for each variety. The weight of 100 kernels ranged from 3.7 to 6.4 gm. and of 1 liter from 720 to 833 gm. The specific gravity varied from 1.294 to 1.390.

Clover and grass seeds, with reference to valuation, and the present status of their production and trade from the local standpoint, A. BOERGER (*Landw. Jahrb.*, 42 (1912), No. 1, pp. 1-118, pls. 18).—In a discussion concerning seeds from various countries and localities it is noted that in general, in so far as investigations have been made, seeds have produced better when grown in the locality where planted.

Considerable space is devoted to the discussion of means of forming and operating organizations to promote the production, use, and trade in a high quality of grass and clover seeds. Tables give data regarding foreign trade in seeds and the home supply and demand.

Seed tests, L. HILTNER ET AL. (*Landw. Jahrb. Bayern*, 2 (1912), No. 9, pp. 636-664).—An article in which results of germination and purity tests of clover and grasses from European sources are given and discussed.

HORTICULTURE.

Garden farming, L. C. CORBETT (*Boston, Chicago, and London*, 1913, pp. X+473, figs. 175).—A practical treatise on the intensive and extensive culture of vegetables in which the author presents in considerable detail the results of his own observations and investigations, together with those of other horticultural authorities.

The successive chapters of part 1 discuss vegetable gardening, or olericulture; the soil as a factor in the work of the market gardener; principles of planting and cultivation; forcing and forcing structures; root cellars and storage houses; transportation of truck crops; precooling and cold storage of vegetables; and the home vegetable garden. In part 2 the commercial vegetables are arranged in alphabetical order and considered with reference to their development, cultivation, and uses.

Pomology, horticulture, and viticulture, E. REIMERS (*Jahresber. Landw.*, 27 (1912), pp. 229-250).—A review of recent contributions to the knowledge of pomology, horticulture, and viticulture in Germany.

Report of field work by the horticultural department during 1911, A. L. DACY (*West Virginia Sta. Rpt. 1912*, pp. 78-97, figs. 13).—This report reviews cooperative spraying and pruning demonstrations conducted in different sections of West Virginia during 1911. Some suggestions are also given relative to the possibilities of truck growing in the State. As a result of orchard demonstrations greatly increased returns have been reported by the owners.

[Fruit trees in Paraguay], G. T. BERTONI (*Agronomia [Puerto Bertoni]*, 5 (1913), No. 5-6, pp. 185-204).—Descriptive notes are given of a large number of tropical and semitropical fruits suitable for culture in Paraguay.

Wild fruits of Paraguay, G. T. BERTONI (*Agronomia [Puerto Bertoni]*, 5 (1913), No. 5-6, pp. 205-207).—The author enumerates a number of wild fruits belonging to the genera *Psidium*, *Eugenia*, *Rollinia*, and *Anona*, with special reference to their value for cultivation.

The pubescent-fruited species of *Prunus* of the Southwestern States, S. C. MASON (*U. S. Dept. Agr., Jour. Agr. Research*, 1 (1913), No. 2, pp. 147-178, pls. 8, figs. 8).—The author here describes seven species of *Prunus* found in the flora of the western United States which are more closely allied to some of the Asiatic species of this genus than to the wild plums of the country. They are discussed with special reference to their adaptation as stocks for cultivated forms under the climatic and soil conditions of the Southwest, and also as offering possibilities to the plant breeder.

The species discussed include the Texas wild peach (*P. texana*) and hybrid forms, the Nevada wild almond (*P. andersonii*), the desert apricot (*P. eriogyna* n. sp.), the California desert almond (*P. fasciculata*), the Texas almond (*P. minutiflora*), the Mexican almond (*P. microphylla*), and Havard's almond (*P. havardii*).

Fruit variety tests on the Southern Utah Experiment Farm, A. B. BALLANTYNE (*Utah Sta. Bul.* 124, pp. 59-110, pl. 1, figs. 3).—In continuation of a previous report (*E. S. R.*, 18, p. 936) this bulletin reports the condition up to 1910 of various orchard fruits, nuts, and grapes under test on the experimental farm.

Summarizing the results as a whole the test indicates that one may safely plant Elberta and Heath Cling peaches, most of the prunes, and at least the Bartlett pear on any soil in southern Utah that is at all adapted to fruit culture. Unusual care must be exercised in the selection of orchard sites, however, with special reference to spring frosts and soil drainage in order to avoid the consequent loss of fruit and early death of the trees. Tests conducted with various nuts indicate that, with the possible exception of pecans, nut culture is not promising for southern Utah. Generally speaking, the standard American grapes of the northern sections do not thrive. *Labrusca-Vinifera* hybrids, such as Isabella, Agawam, and Goethe, do well and the section appears to be adapted for many varieties of European grapes including fresh, raisin, and wine grapes.

Orchard notes, J. B. THOMPSON (*Guam Sta. Rpt.* 1912, pp. 24-26, pl. 1).—A brief statement of work accomplished in the introduction and establishment of various fruits in Guam, including the mango, peach, kumquat, amatungula (*Carissa arduina*), and the banana.

Fruit for exhibition, L. D. BATCHELOR (*Utah Sta. Circ.* 13, pp. 9-11).—In this circular the author briefly discusses the selection, storing, and arrangement of exhibition fruit, and presents a score card showing the important points for consideration in show fruit.

Box packing of apples, E. F. PALMER (*Ontario Dept. Agr. Bul.* 216, 1913, pp. 24, figs. 23).—Popular directions are given for making various styles of packs in boxes, including plans for packing houses and the necessary equipment.

Packing Indiana apples, W. R. PALMER (*Indiana Sta. Circ.* 39, pp. 28, figs. 15).—This circular discusses the equipment needed and the methods used in sizing, grading, and packing both barrels and boxes. Recent legislation pertaining to the subject is noted in the appendix.

Cold storage for Iowa-grown apples, L. GREENE (*Iowa Sta. Bul.* 144, pp. 357-378, figs. 2).—In continuation of a previous investigation (*E. S. R.*, 22, p.

142) the results of cold storage studies with apples conducted during the past 4 years are here reported.

A number of experiments were made to determine the effect of freezing the apples previous to storage upon their keeping quality in cold storage. It was found that apples which are frozen upon the trees in the fall can be safely placed in cold storage if they are still sound after having thawed out gradually on the tree before picking. Apples which are frozen in cold or in common storage will not be seriously injured if thawed out below freezing temperature.

A number of tests were made of cellar as compared with cold storage. As a result of these tests it would seem that where cold storage can be had close at hand it would be economical to store fruit for one or two months at a monthly rate until the cellar storage could be cooled to proper temperatures and then the fruit removed to the cellar. Cellar storage throughout the season in comparison with cold storage kept such varieties as Winesap and Mammoth Black Twig until May 1 in excellent condition, whereas such varieties as Grimes Golden and Jonathan in cellar storage should be marketed before January 1. By the use of early cold storage previous to cellar storage the season for Grimes Golden was prolonged to February 1.

In order to keep well in cold storage the fruit should be thoroughly ripened, well colored, and carefully handled. If the fruit has not been properly ripened delaying the storage after packing for a short time may prove beneficial, providing the weather remains cool. Wrapping the fruit with paper retards the ripening process, prevents bruising in shipment, and delays the appearance of scald, thus lengthening the storage season from 2 weeks to several months according to variety. From an economic standpoint, however, wrappers are out of the question, except for fancy boxed apples or where packed for special purpose in barrels. Other conditions being equal, the package in which the apples are stored has but little influence on their keeping qualities.

But little difference was found in the keeping qualities of fruit from cultivated and from sod orchards. Fruit selected for the extreme storage limit should be of medium size for the variety, since overgrown specimens do not keep as well as the smaller ones. Apple scald was found to attack immature, poorly colored fruit first. If the temperature is high enough to allow the fruit to continue the ripening processes the appearance of scald is somewhat delayed.

The cold storage variety testing was continued during the past 4 years. The results as here noted indicate that the principal commercial varieties in Iowa can nearly all be handled profitably in cold storage.

The American peach orchard, F. A. WAUGH (*New York and London, 1913, pp. 238, pl. 1, figs. 65*).—A treatise on the practice of peach growing in North America at the beginning of the twentieth century. The successive chapters of this work discuss peach growing geography, climatology, soils and exposures, how to get the trees, orchard planting, general management, cover crops, the use of fertilizers, pruning and renovation, insect enemies, diseases of tree and fruit, spraying, marketing the crop, the family orchard, botanical and pomological status, choosing varieties, variety catalogue, the nectarine, utilizing the fruit, and a historical sketch of the peach industry.

Maurer's gooseberry book, L. MAURER (*Maurer's Stachelbeerbuch. Stuttgart, 1913, pp. XIII+347, pls. 15, figs. 158*).—A descriptive account of the best and most widely cultivated varieties of gooseberries. Introductory considerations deal with the botany, anatomy, and culture of the gooseberry, weights and measurements of gooseberry fruits, methods of classification, and choice of varieties for general culture.

The practice of grape growing in its various phases.—I, The technique of grape grafting, A. WANNER (*Die Praxis des Weinbaus in Einzeldarstellungen. I. Die Technik der Rebenveredlung. Strassburg, 1913, pp. 83, figs. 53*).—A practical treatise on the propagation and grafting of grapes, including the care of the grafted plants in the nursery.

Study of the influence of various grape stocks on the quality and quantity of the harvest, H. FAES and F. PORCHET (*Terre Vaud., 5 (1913), Nos. 18, pp. 191-193, fig. 1; 19, pp. 204, 205, fig. 1; 20, pp. 211-213, figs. 2; 21, pp. 227-229, figs. 2; 22, pp. 245-247, figs. 2; 24, pp. 265-268, figs. 2; 26, pp. 285-288, figs. 3; 28, pp. 307-310, figs. 3; 31, pp. 335-338, figs. 4; 33, pp. 351, 352*).—In order to determine the adaptability of a number of pure American, American hybrid, and French-American hybrid stocks for the Chasselas grape 9 experimental vineyards were established under the direction of the Lausanne Viticultural Station. The results of this investigation as indicated by the quality and quantity of the harvest in 1911 and 1912 are here reported and discussed.

The sexual elements of grape hybrids, M. GARD (*Compt. Rend. Acad. Sci. [Paris], 157 (1913), No. 3, pp. 226-228*).—The author's investigations lead him to conclude that the deviations from normal in the sexual elements of grape hybrids are confined to the male flower, the female flower remaining normal. Among European cultivated grapes the pollen is oftentimes normal, and at other times normal, hollow-grained, and intermediate forms of pollen occur on the same plant, but the normal grains are usually the more numerous. Pollen from short stamens, although not infertile, is incapable of close fertilization.

Report on the variability of the coffees grown in the Dutch East Indies, P. J. S. CRAMER (*Meded. Dept. Landb. [Dutch East Indies], 1913, No. 11, pp. XVI+696, pls. 23, figs. 5*).—This comprises a comparative study of the varieties of coffee commonly grown in the Dutch East Indies, including also observations on recently introduced forms. Introductory considerations deal with the present status of coffee culture and varieties in Java, the introduction of new sorts for cultural tests, variability, comparative characteristics of different kinds of coffee, seed tests, and the methods followed in the descriptions of the parent trees.

Part 2 discusses in detail the varieties of *Coffea arabica*, including small-leaved, colored, erect, pendulous, and the strong-growing forms. The species discussed in the succeeding parts include *C. liberica*, *C. abeokutae*, *C. stenophylla*, *C. excelsa*, *C. ugandae*, and *C. congensis*.

First report on selection tests of Robusta coffee, C. J. J. VAN HALL (*Meded. Proefstat. Midden-Java, 1912, No. 7, pp. 23*).—With the view of securing an improved form of Robusta coffee, a large number of plants were studied with reference to variations in productivity, disease resistance, weight of marketable product as compared with yield, and quality of the berry. The results of this test are here presented in tabular form and discussed.

On the tarring of pruning-wounds in tea plants, C. BERNARD and J. J. B. DEUSS (*Dept. Landb., Nijv. en Handel [Dutch East Indies], Meded. Proefstat. Thee, 1913, No. 25, pp. 1-8*).—In a preliminary test of various tar preparations, black gas house tar gave the most satisfactory results as a dressing for wounds resulting from pruning tea plants.

Tea manuring experiments, C. BERNARD and J. J. B. DEUSS (*Dept. Landb., Nijv. en Handel [Dutch East Indies], Meded. Proefstat. Thee, 1913, No. 25, pp. 9-26, figs. 7*).—Some fertilizer investigations with tea in Java are here reported and discussed.

Leucæna glauca as a green manure for tea, C. BERNARD (*Dept. Landb., Nijv. en Handel [Dutch East Indies], Meded. Proefstat. Thee, 1913, No. 25, pp.*

27-30, pls. 3).—Favorable results in the use of *L. glauca* as a green manure crop for tea plantations are here reported.

Individual variation in the alkaloidal content of belladonna plants, A. F. SIEVERS (*U. S. Dept. Agr., Jour. Agr. Research*, 1 (1913), No. 2, pp. 129-146, fig. 1).—The author has started an investigation to determine the possibility of modifying the chemical constituent of a plant by breeding and selection. This paper presents the results of three years' observations relative to the variation of the quantity of alkaloids in the belladonna plant as studied at the drug-testing garden at Bell, Md., and at the Arlington Experimental Farm.

Summarizing the work as a whole it was found that the variation of the percentage of alkaloids in the leaves of the different plants is exceedingly large, hence the testing of a general sample from all plants collectively is not always a safe means of judgment. A considerable number of plants with leaves rich in alkaloids in one season were found to have equally rich leaves in the following season, and they frequently manifested the same characteristics at the various stages of growth during the season in comparison with other plants. The same facts were true with regard to plants which bear leaves with a low percentage of alkaloids. Thus far, however, nothing has been found to indicate that any correlation exists between the physical appearance of the plant and the alkaloidal content of its leaves, luxuriant growth being no criterion of the medicinal value of the plant.

From the point of view of the percentage of alkaloids present in the leaves and the quantity of material available, the leaves can be picked to best advantage from the time of flowering until the early berries begin to ripen. They are richer in alkaloids later in the season but are then too small and sparse for harvesting.

Rose geranium culture, E. CHARABOT and C. L. GATIN (*Jour. Agr. Trop.*, 13 (1913), No. 148, pp. 289-295).—A descriptive account in which consideration is given to the origin of rose geranium culture in France, Algeria, and Réunion, methods of propagation, cultural details, enemies and diseases, harvesting, distillation and yields, and the present and future status of the industry.

FORESTRY.

Forestry, H. HAUSRATH (*Die Waldwirtschaft. In Das Leben der Pflanze, Abt. IV: Die Pflanzen und der Mensch, Vol. I. Stuttgart, 1913, pp. 471-611, pls. 4, figs. 70*).—An encyclopedic treatise in which consideration is given to the history of forestry, forest management, forest protection, forest statistics, beneficial effects of woods, and ornamental value of woodlands.

Forestry, A. KOSTLAN (*Jahresber. Landw.*, 27 (1912), pp. 215-228).—A review of recent contributions to forest literature in Germany.

Logging, R. C. BRYANT (*New York and London, 1913, pp. XVIII+590, figs. 133*).—A text-book on the principles and general methods of operation in the United States. Part 1 contains a general discussion of forest resources, protection of forest property, and timber bonds. The succeeding parts take up in detail the methods of preparing logs for transport, land transport, water transport, summary of logging methods in specific regions, and minor industries.

A bibliography together with terms used in logging (E. S. R., 17, p. 373), log rules, and other data relating to the industry are appended.

Work of the Dominion Forestry Branch, R. H. CAMPBELL (*Com. Conserv. Canada Rpt.*, 4 (1913), pp. 32-40).—A review of the work of the Dominion Forestry Branch, presented at the fourth annual meeting of the Commission of Conservation of Canada, Ottawa, January 21-22, 1913.

[Report of the] committee on forests, C. LEAVITT ET AL. (*Com. Conserv. Canada Rpt.*, 4 (1913), pp. 16-31, 178-180, pls. 3).—This comprises the report of the forestry committee of the Commission of Conservation of Canada for the fiscal year ended March 31, 1913, including also the resolutions pertaining to forestry that were adopted by the commission.

Forest policy of British Columbia, W. R. ROSS ([*Victoria*], 1913, pp. 17).—This is a full report of the author's speech in which he reviews the progress that forest conservation has made in British Columbia.

Avondale Forestry Station, A. C. FORBES (*Dept. Agr. and Tech. Instr. Ireland Jour.*, 14 (1913), No. 1, pp. 102-125, pls. 6).—This comprises a general description of the Avondale Forestry Station, including a progress report of the work for the period 1906 to 1912.

Report on forest statistics of Alsace-Lorraine (*Beitr. Forststatist. Elsass-Lothringen*, 1911, No. 30, pp. 100, figs. 17).—This is the customary statistical review, for the year 1911, relative to the administration of the state, public, and community forests in Alsace-Lorraine. Detailed and summarized data dealing with forest areas, silvicultural operations, products, revenues, expenditures, etc., are given, including a comparative summary for each year since 1872.

The sun energy in the forest, M. WAGNER (*Allg. Forst. u. Jagd Ztg.*, 89 (1913), June, pp. 185-200; July, pp. 225-242, fig. 1; Sept., pp. 297-316, fig. 1; Oct., pp. 333-351, fig. 1).—A study of the relation of the sun's energy to forest growth, in which the author sets forth his observations and deductions in a series of articles as follows: (1) The Influence of Geographic Latitude on Crown Development, Volume Production, Stem Basal Area, Stem Number, and Brush Wood; (2) The Distribution of the Sun's Rays in the Forest, with Special Reference to the Selection Strip Cutting; (3) The Absorption of Sun Energy in Green Plant Leaves and Its Relation to the Locality and to Volume Production; and (4) Light Measurements in the Forest and Their Importance for Practical Forestry.

Contribution to the knowledge of the influence of aquatic mediums on the roots of trees, G. BONDOIS (*Ann. Sci. Nat. Bot.*, 9. ser., 18 (1913), No. 1-2, pp. 1-24, figs. 9).—The author's investigations as here reported lead him to conclude in general that although the adaptation of tree roots to aquatic mediums may be less marked than their adaptation to aerial mediums it is nevertheless quite appreciable. The roots appear to be influenced by both the physical and chemical nature of the water. Since water is a homogeneous medium the root growth is equal and symmetrical in all directions. On account of its density the water acts as a partial support to the roots, whence arises a reduction in the supporting system. In order to adapt themselves for floating the roots lighten themselves by the development of air cells. Since the food supplied to the roots is liquid the absorption and conducting systems become reduced. Since the absorption takes place throughout the emerged surface a great abundance of lenticels are formed on the older roots.

Florida trees, J. K. SMALL (*New York*, 1913, pp. IX+107).—This handbook contains descriptions of all the trees known to the author to be native to or to grow naturally in Florida.

The forests of the Far East, A. HOFMANN (*Aus den Waldungen des fernen Ostens. Vienna and Leipsic*, 1913, pp. VIII+225, pls. 56, figs. 9).—A descriptive account of the forests and of forestry in the Far East, based upon the author's travels and studies in Japan, Formosa, Korea, and the bordering districts of eastern Asia, together with a review of the literature on the subject.

Introductory considerations deal with the geology, climate, and forest geography of the region under discussion. The succeeding chapters deal with the silvicultural practices; ownership and management relations; utilization; timber sales; wood industries and trade; strength investigations; transportation; forest policies, laws, and administration; the relation between the forests and streams; game and hunting; and the national attitude toward the forests.

Some Douglas fir plantations.—II, Cochwillan wood, near Llandegai, North Wales, T. THOMSON (*Jour. Bd. Agr. [London]*, 20 (1913), No. 6, pp. 499-503).—In continuation of previous observations on Douglas fir plantations (E. S. R., 29, p. 644) some diameter, height, and volume measurements are given for a 58-year-old Douglas fir stand growing in a mixture with oak, near Llandegai, North Wales.

The structure of the wood of East Indian species of *Pinus*, P. GROOM and W. RUSHTON (*Jour. Linn. Soc. [London] Bot.*, 41 (1913), No. 283, pp. 457-490, pls. 2).—In the first part of this paper the authors give their general conclusions and summarize the results secured from a detailed study of the wood structure of 5 species of East Indian pine. The second part of the paper describes in detail the wood structure of the different species.

The kapok trees of Togo, E. ULBRICH (*Notizbl. K. Bot. Gart. u. Mus. Berlin*, 6 (1913), No. 52, pp. 39-65, figs. 2).—This comprises the results of inquiries sent out to the various districts of Togo relative to the characteristics and varying forms of the kapok trees.

The "wood-oil" trees of China and Japan, E. H. WILSON (*Bul. Imp. Inst. [So. Kensington]*, 11 (1913), No. 3, pp. 441-461, pls. 5).—The author here gives a descriptive account of the Chinese wood oils and the trees yielding them, with special reference to the utilization of these facts by various departments of agriculture in the warm temperate and subtropical parts of the world which contemplate the experimental culture of these trees. A revision of the synonymy with principal references to the literature is appended.

Tagua, vegetable ivory, E. ALBES (*Bul. Pan Amer. Union*, 37 (1913), No. 2, pp. 192-208, figs. 21).—A descriptive account is given of the tagua palm (*Phytelphas macrocarpa*) with reference to its botany and habitat, methods of harvesting and marketing the tagua nuts, and their utilization in the manufacture of vegetable ivory buttons.

Uses of commercial woods of the United States.—Beech, birches, and maples, H. MAXWELL (*U. S. Dept. Agr. Bul.* 12, pp. 56).—In continuation of previous studies of the commercial woods of the United States (E. S. R., 26, p. 50) consideration is here given to the closely related beech, birch, and maple group, including some 18 commercial species, with special reference to the physical properties, supply, and uses of the various woods.

The wood-using industries of Iowa, H. MAXWELL and J. T. HARRIS (*Iowa Sta. Bul.* 142, pp. 237-304, figs. 13).—This report embraces the results of an investigation conducted cooperatively by the Forest Service of the U. S. Department of Agriculture and the Iowa Station relative to the utilization by various industries in Iowa of wood after it has left the sawmill. The data presented and discussed show the total demands for each species by the different industries; cost of the raw material f. o. b. factory; the articles made from each kind of wood; the relative amounts supplied by the State and by outside States; and the qualities of the wood which recommend it for a specific use.

A directory of Iowa wood users is given and the following special chapters are also included: The Timber Resources of Iowa, by G. B. MacDonald (pp. 291-300); and White Pine in Iowa, by N. C. Brown (pp. 301-304).

Forest products of Canada, 1912.—Lumber, square timber, lath, and shingles, R. G. LEWIS and W. G. H. BOYCE (*Dept. Int. Canada, Forestry Branch*

Bul. 40, 1913, pp. 67, pl. 1).—A statistical report on the manufacture of lumber, square timber, lath, and shingles in the Dominion and the various Provinces for the calendar year 1912. The production is also indicated by species.

The total value of lumber, square timber, lath, and shingles produced in Canada in 1912 was \$76,540,879, of which amount the lumber represents about \$69,500,000.

To get long life from untreated timber in trestles (*Engin. Rec.*, 68 (1913), No. 20, p. 542).—This comprises suggestions made by the committee on the preservation of timber of the American Railway Bridge and Building Association relative to methods of prolonging the life of overhead timber and piles used in trestle work which receive no preservative treatment. A table is also given showing the relative length of life of various structural timbers in contact with the soil and in the air.

DISEASES OF PLANTS.

Smut diseases of cultivated plants, their cause and control, H. T. GÜSSOW (*Canada Cent. Expt. Farm Bul. 73, pp. 57, figs. 9).*—After a general discussion of smuts as related to plants, the author describes the smuts of wheat, barley, oats, corn, broom corn, and millet, giving methods for their control, as far as definite recommendations can be made.

Further cultures of heteroecious rusts, W. P. FRASER (*Mycologia*, 5 (1913), No. 4, pp. 233-239).—The author adds to studies previously reported (*E. S. R.*, 28, p. 51) an account of 5 rusts of the genus *Uredinopsis* whose life histories are claimed to be established for the first time; and, in addition, 3 life histories supplementing previous work.

Some important contributions on fungus diseases of plants appearing in 1912-13, E. RIEHM (*Mycol. Centbl.*, 3 (1913), No. 2, pp. 66-76).—Brief notes are given of studies on plant diseases in 1912-13, concluding with a list of about 80 articles representing about 70 different contributors.

Diseases of agricultural crops, 1912, J. LIND, SOFIE ROSTRUP, and F. K. RAVN (*Tidsskr. Landbr. Planteavl*, 20 (1913), No. 2, pp. 249-280).—The more important plant diseases and insect pests observed in Denmark during the year are described and discussed.

Work of the phytopathological section of the central agricultural experiment station in Stockholm in 1912, J. ERIKSSON (*Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases*, 4 (1913), No. 7, pp. 1005-1008).—A condensed account is given of observations carried out on potato diseases, including *Phytophthora infestans*, *Hypochnus solani* or *Rhizoctonia solani*, and *Chrysophlyctis endobiotica* or *Synchytrium solani*; on beet diseases, including *Uromyces betæ*, *Bacillus tabificans*, *R. violacea*, *Phoma betæ*, *Cercospora beticola*, *Sporidesmium putrefaciens*, etc.; on withering of blooms on fruit trees; and on various diseases of vegetables. A list of the station publications appearing in 1912 is also given.

Work of the observatory of phytopathology in Turin, P. VOGLINO (*Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases*, 4 (1913), No. 7, pp. 1000-1005).—This is a brief account of the organization of this institution, and of parasitic fungi, etc., studied there, by years from 1904 to 1912.

Plant diseases, E. W. DAVY (*Nyasaland Dept. Agr. Ann. Rpt. 1913, pp. 23, 24).*—Brief notes are given on the occurrence of frog-eye of tobacco due to *Cercospora nicotianæ*, the attack of safflower by a species of *Vermicularia*, a disease of Ceara rubber tree due to some species of *Polyporaceæ* as yet undetermined, and the orange scab caused by *Cladosporium citri*. The presence of

peculiar wart-like excrescences on the leaves of oranges is reported from Central Angoniland, but so far no fungus or other growth has been found associated with this trouble. A blackening and dying of the shoots of young camphor trees is reported, due to some indeterminate cause, as is also a spasmodic disease of tea, in which a shot hole effect is produced on the leaves.

Some fungi parasitic on tropical plants, E. GRIFFON and A. MAUBLANC (*Bul. Trimest. Soc. Mycol. France*, 29 (1913), No. 2, pp. 244-250, pl. 1, figs. 2; *abs. in Internat. Inst. Agr. [Rome]*, Mo. *Bul. Agr. Intel. and Plant Diseases*, 4 (1913), No. 7, pp. 1120, 1121).—The authors report as the result of their study of material sent from the mouth of the Amazon that *Dothidella ulei* in its various forms is found living parasitically on leaves of *Hevea brasiliensis*. It seems to be harmless under normal conditions although nursery plants, as in case of some examined, may suffer considerably from its presence.

On leaves of *Butyrospermum parkii* from near Kulikoro (Upper Senegal and Niger), were found 2 fungi considered to be new and described under the names of *Fusicladium butyrospermi* and *Pestalozzia heterospora*.

Handbook of fungus diseases of the potato in Australia and their treatment, D. MCALPINE (Melbourne: Dept. Agr. Victoria, 1912, pp. III+215, figs. 158, map 1; *rev. in Nature [London]*, 92 (1913), No. 2289, p. 27).—In this book the author gives detailed accounts of the diseases of the potato, particularly those caused by *Phytophthora infestans*, *Alternaria solani*, *Rhizoctonia* sp., *Fusarium solani*, *Bacillus solanacearum*, and the diseases known as scab.

Bacterial disease of potatoes, T. G. B. OSBORN (*Jour. Dept. Agr. So. Aust.*, 17 (1913), No. 1, pp. 19-21, fig. 1).—Specimens of potatoes attacked by the bacterial rot (*Bacillus solanacearum*) were submitted to the author for study, and it seems that this disease has become established in South Australia. The disease occurs also in Victoria, where it is popularly known as sore eyes, from the moist condition of the buds in the early stages of the rot.

Suggestions are given for the control of the disease, which include the removal and burning of infected plants, the use of clean seed tubers, and the rotation of crops.

Report of the committee for study of leaf roll.—VII, Biology of the potato plant with particular reference to leaf roll, O. REITMAIR (*Ztschr. Landw. Versuchsw. Österr.*, 16 (1913), No. 6, pp. 653-717).—Besides a discussion of statements by other investigators, the author gives in continuance of previous reports (*E. S. R.*, 27, p. 447) the results obtained in a series of recent investigations. He states in conclusion that while leaf roll is a relative term rendering reports by various observers uncertain or conflicting in cases not very marked, it may be stated with a degree of certainty that instances of transitory leaf roll or of recovery in well established cases have not been seen by him; that this trouble normally shows itself relatively late in the development of the potato plant, usually near the middle of June, when individuals which have inherited this trouble in typical degree show along with precocious blooming a development of storing organs and marked setback in growth of the plant, especially as regards the root system; that as soon as the other signs of leaf roll appear, a disturbance or checking of the transportation of elaborated materials from the leaves is observable with alterations of phloem, concerning which further study is regarded as desirable; and that considerable variations are observable as regards the degree of susceptibility of different varieties of potatoes to this trouble.

The recent researches of Quanjer as to the cause of potato leaf roll and Sorauer's standpoint, P. SORAUER (*Ztschr. Pflanzenkrank.*, 23 (1913), No. 4, pp. 244-253).—A critical discussion of an article previously noted (*E. S. R.*,

29, p. 347), citing also views of other investigators regarding leaf roll of potatoes.

The persistence of the potato late blight fungus in the soil, F. C. STEWART (*New York State Sta. Bul.* 367, pp. 357-361).—On account of conflicting statements regarding the persistence of the fungus *Phytophthora infestans* in the soil and the discovery of the oospores of the potato blight (E. S. R., 25, p. 545), the author carried on experiments in soil from a field in which a large portion of the potato crop had been destroyed by the *Phytophthora* rot. The soil together with a quantity of blighted potato stems was placed in wooden boxes, which were left in the field until late in January when they were brought into the greenhouse and planted to potatoes. A second experiment, which was practically a repetition of the first with some modifications, was conducted, but the results were negative in each case.

The conclusion is reached that while the negative results do not prove that the *Phytophthora* does not persist in the soil, they make such persistence appear highly improbable, and the removal of diseased tubers from the field, as recommended by Massee (E. S. R., 17, p. 45), is considered unnecessary. While the planting of potatoes after potatoes is said to have a tendency to increase scab, wilt, and other diseases, it is believed that there is no risk in the practice so far as the late blight or rot is concerned.

Does winter kill potato blight in the soil? F. H. HALL (*New York State Sta. Bul.* 367, popular ed., p. 1).—This is a popular edition of the above.

Potato spraying experiments in 1911, N. J. GIDDINGS (*West Virginia Sta. Rpt.* 1912, pp. 77, 78).—An account is given of experiments conducted at Moundsville, W. Va., during 1911 with the object of determining the relative value of Bordeaux mixture when prepared by various methods of mixing or by using formulas other than those commonly employed. Atomic sulphur was also tested as a spray for potatoes.

The weather during the early part of the season was exceedingly dry and hot, and many of the plants were destroyed. The results as to spray mixtures are not considered of any special value, as it was impossible to get the potatoes sprayed at a time when they were most seriously in need of it.

Ufra disease of rice, E. J. BUTLER (*Agr. Jour. India*, 8 (1913), No. 3, pp. 205-220, pl. 1, fig. 1).—In continuation of a preliminary note (E. S. R., 28, p. 151), a detailed account is given of a study of this rice disease in India.

Two distinct manifestations of the disease are described, and it has been definitely determined that it is due to *Tylenchus* sp. The occurrence of this disease has been known for a number of years, but only recently has it become very destructive, losses of from 10 per cent to total destruction of fields having been reported.

The different crops of rice are said to be affected in unlike manner, and transplanted rice seems practically free from attack. A lack of aeration of the soil is thought to favor the attack of the nematodes, but other considerations, among them the accumulation of nitrites, must be taken into account in plans for the control of this disease. A special grant has been made in Bengal for extensive experiments on means for its control.

Notes on sereh disease of sugar cane, S. F. ASHBY (*Bul. Dept. Agr. Jamaica, n. ser.*, 2 (1913), No. 7, pp. 239, 240, pl. 1).—On account of the suspected occurrence of the sereh disease of sugar cane in Trinidad, the author gives a description of the external and internal appearances of diseased cane. Two views are held regarding the cause of this disease, one that it is due to a gum-forming bacterium, and the other that it is caused by a lack of balance in enzym action within the living cells of the plant, brought about by abnormal conditions of the soil, cultivation, manuring, etc.

Rangpur tobacco wilt, C. M. HUTCHINSON (*Mem. Dept. Agr. India, Bact. Ser., 1 (1913), No. 2, pp. 67-84, pls. 12*).—The wilting of tobacco plants, due to infection with a bacterium similar to *Bacillus solanacearum*, is said to occur annually in the Rangpur district of Bengal. It is thought that the infecting organism is probably unable to gain entrance into the plant except through the intervention of some mechanical injury or of organisms such as nematodes, which bore into the roots of the plant.

For the control of the disease attempts should be made to conserve the soil moisture and develop the root system so as to produce a better and more rapid growth. All diseased plants should be removed and burned, and the use of alkaline manures should be avoided as much as possible.

Diseases of the tomato in Louisiana, C. W. EDGERTON and C. C. MORELAND (*Louisiana Stas. Bul. 142, pp. 23, figs. 3*).—There are said to be ten diseases of tomatoes known in Louisiana as follows: Tomato wilt (*Fusarium lycopersici*), early blight (*Alternaria solani*), Sclerotium wilt disease (*S. rolfsii*), root knot (*Heterodera radiculicola*), blossom end rot, leaf mold (*Cladosporium fulvum*), anthracnose (*Glæosporium fructigenum*), southern tomato blight (*Bacterium solanacearum*), leaf curl, and damping off (*Rhizoctonia* sp.). These diseases are described at some length and means are suggested for their prevention, as far as any are known.

In connection with the wilt the author states that some wilt resistant varieties have been developed at the station at Baton Rouge, and seed of these is to be distributed for further trial in the State.

Apple leaf spot (*Jour. Bd. Agr. [London], 20 (1913), No. 6, pp. 513-515, pl. 1*).—A description is given of the apple leaf spot due to *Sphæropsis malorum*, which, it is said, has only recently been reported in Great Britain, although in all probability it has been present for a considerable time and has been overlooked or confused with other diseases.

Peach leaf curl fungus: Further tests with copper compounds, G. QUINN (*Jour. Dept. Agr. So. Aust., 17 (1913), No. 1, pp. 28-32*).—In 1910 a series of spraying tests for the control of the peach leaf curl fungus (*Euxoascus deformans*) was reported (*E. S. R., 26, p. 144*). In 1911 the treatment as planned was not carried out, but it was repeated in 1912, and an account is given of the results. The spraying compounds used were Bordeaux mixture, Burgundy mixture, Woburn Bordeaux mixture, copper sulphate solution, and Bordeaux powder.

As a result of the two seasons' trials, Burgundy mixture is deemed well adapted to the control of the peach leaf curl. When applied twice during the season ordinary Bordeaux mixture was very efficient, and a single season's trial has given similar results with the Woburn Bordeaux mixture. Copper sulphate solution, while giving good results in 1910, proved almost a failure in 1912, so far as the control of the disease was concerned. The Bordeaux powder seems to be promising, but the results of 1 and 2 applications are said to be contradictory.

Comparative experiments with sprays against leaf cast of grape, A. BRETSCHNEIDER (*Ztschr. Landw. Versuchsw. Österr., 16 (1913), No. 6, pp. 718-725*).—Giving the results of recent experiments with means of combating *Peronospora viticola*, the author sums up the results of his studies during about four years (*E. S. R., 27, p. 652*) by stating that besides Bordeaux mixture some commercial preparations have been found entirely satisfactory and a few others named measurably so, while still others mentioned as on trial seem to promise good results.

A disease of cacao trees due to *Lasiodiplodia theobromæ*, P. BERTHAULT (*Bul. Trimest. Soc. Mycol. France, 29 (1913), No. 3, pp. 359-361; Agron. Colon.,*

1 (1913), No. 1, pp. 8-14, pl. 1, figs. 3).—The author states that in Dahomey a disease of cacao trees is present which is commonly designated as sunstroke or apoplexy. The leaves on the trees often turn yellow, dry, and fall without the trees showing any pronounced indication of disease. The trouble seems most prevalent during the dry season, and in certain regions three-fourths of the plants have been attacked. A study of the leaves showed they were parasitized by a fungus which proved to be *L. theobromæ*. The synonymy of the fungus is given, from which it appears that it has been previously described under a number of names.

Nematode worms and mottled leaf, J. R. HODGES (*Mo. Bul. Com. Hort. Cal.*, 2 (1913), No. 6, pp. 555, 556).—An account of investigation and treatment of mottled leaf of citrus trees.

An examination of affected trees on different kinds of soil showed an imperfect condition in the fibrous root system common to all trees badly affected with mottled leaf. By scraping the rootlets while submerged in water, live, actively moving nematodes were found, in many cases these being very numerous on badly decayed roots. It is suggested that these often infest the roots of transplanted nursery stock and that they also spread from one tree to another in irrigation and storm water. It is said that some of these nematodes were kept for 8 days in water without apparent injury. In badly infested orchards they appear to attack also the roots of various weeds.

The author reports some success in treating affected trees with carbon bisulphid. The best results were obtained by making shallow holes about 2 in. deep, 1 ft. apart each way, and putting about three-fourths of an ounce of carbon bisulphid in each hole, the ground being then covered with an impervious tent or cloth which was allowed to remain for about 48 hours. After this treatment no live nematodes could be found. Just how much smaller dosage could be used with success is not known, but trees treated with greater amounts showed injury, losing their leaves. After treating, the ground was covered with a mulch of barnyard manure about 1 in. thick which kept up an even moisture content of about 10 per cent during the season following. The trees then showed a normal condition of fibrous roots, and while not entirely free from the nematodes, they are now reported as doing very well.

Two fungi as causal agents in gummosis of lemon trees in California, H. S. FAWCETT (*Mo. Bul. Com. Hort. Cal.*, 2 (1913), No. 8, pp. 601-617, figs. 12).—It is stated that at least two forms of gummosis occur in California that are readily transmissible by inoculation. One of these is due to the fungus *Botrytis vulgaris*, the other to the brown rot fungus (*Pythiacystis citrophthora*).

The *Botrytis* gummosis is characterized by the killing of the outer layer of the bark much in advance of the inner, and by a softening of the bark and the production of spores in moist weather, where the bark is entirely killed to the wood. The brown rot gummosis is characterized by the killing of the bark to the wood as the area of infection advances, without outward evidence of the fungus at any time.

The use of concentrated Bordeaux mixture or Bordeaux paste has given promising results in the treatment of these forms of gummosis if the diseased areas were properly prepared before their application.

Two fungus parasites of *Agati grandiflora*, E. FOEX (*Bul. Trimest. Soc. Mycol. France*, 29 (1913), No. 3, pp. 348-352, figs. 3).—Descriptions are given of *Oidium agatidis* n. sp. and *Cercospora agatidis* n. sp., parasitic on *A. grandiflora*, an ornamental tree extensively grown in Cochin China.

The structure and systematic position of *Mapea radiata*, R. MAIRE (*Bul. Trimest. Soc. Mycol. France*, 29 (1913), No. 3, pp. 335-338, fig. 1).—In 1906

there was described by Patouillard as new, under the name *M. radiata*, a parasite of the pods of the leguminous tree *Inocarpus edulis*, and at that time it was considered as belonging to the Uredineæ. Other investigators have since claimed that it is only a young form of *Marasmius hygrometricus*.

The author of the present paper reports a cytological study of the fungus. He has grown it on culture media and as the result of inoculation experiments proved it to be a parasite on *Inocarpus* pods. He agrees with Patouillard that the fungus belongs to the Uredineæ and is probably a reduced form of *Uredo*.

A new species of *Endothia*, L. PETRI (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat.*, 5. ser., 22 (1913), I, No. 9, pp. 653-658, figs. 2; *abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases*, 4 (1913), No. 7, pp. 1121, 1122).—The author describes under the name *E. pseudoradicis* a fungus, supposedly new, found near the bases of chestnuts 5 or 6 years old sprung from stumps of trees cut on account of black canker. The *Endothia* is said to show in one direction characters resembling *E. virginiana* and in another those resembling *E. parasitica*.

More on black canker of chestnut in reply to L. Petri, G. BRIOSI and R. FARNETI (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat.*, 5. ser., 22 (1913), II, No. 2, pp. 49-52).—A controversial note, referring also to a report by Ducomet (*E. S. R.*, 28, p. 240).

Critical considerations on black canker of chestnut, L. PETRI (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat.*, 5. ser., 22 (1913), I, No. 7, pp. 464-468).—A discussion of the foregoing article.

Three undescribed heart rots of hardwood trees, especially of oak, W. H. LONG (*U. S. Dept. Agr., Jour. Agr. Research*, 1 (1913), No. 2, pp. 109-128, pls. 2).—In connection with a study of oak trees in the Ozark National Forest, Arkansas, the author recognized at least 20 different kinds of heart rots, some of which appear to have been undescribed. In the present paper detailed descriptions are given of a pocketed or piped rot of the oak, chestnut, and chinquapin, caused by *Polyporus pilotæ*, a string and ray rot of the oak caused by *P. berkeleyi*, and a straw colored rot caused by *P. frondosus*.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Principles of economic zoology, L. S. and M. C. DAUGHERTY (*Philadelphia and London*, 1912, pp. VII+410, figs. 301).—This work combines the salient facts as to the structure, life history, and habits of animals.

Game laws for 1913, T. S. PALMER, W. F. BANCROFT, and F. L. EARNSHAW (*U. S. Dept. Agr. Bul.* 22, pp. 59).—This, the fourteenth annual summary of the game laws of the United States and Canada, has been prepared on the same general plan as those previously issued (*E. S. R.*, 28, p. 853).

Bibliography of Canadian zoology for 1911, L. M. LAMBE (*Proc. and Trans. Roy. Soc. Canada*, 3. ser., 6 (1912), Sect. IV, pp. 101-114).—This annotated list covers the literature exclusive of entomology.

Bibliography of Canadian entomology for 1911, C. G. HEWITT (*Proc. and Trans. Roy. Soc. Canada*, 3. ser., 6 (1912), Sect. IV, pp. 115-127).—One hundred and sixteen titles are listed in this annotated bibliography.

Forty-third annual report of the Entomological Society of Ontario, 1912 (*Ann. Rpt. Ent. Soc. Ontario*, 43 (1912), pp. 143, pl. 1, figs. 42).—Among the more important papers here presented are the following: The Faunal Zones of Canada, by E. M. Walker (pp. 27-33); Review of Entomology Relating to Canada in 1912, by C. G. Hewitt (pp. 34-37); The Chinch Bug in Ontario, by H. F. Hudson (pp. 46-50); Bumblebees and Their Ways, by F. W. L. Sladen

(pp. 50-56); Progress of the Introduction of the Insect Enemies of the Brown-tail Moth, *Euproctis chrysorrhæa*, into New Brunswick and Some Biological Notes on the Host, by J. D. Tothill (pp. 57-61); San José Scale in Nova Scotia, by G. E. Sanders (pp. 61-66); Recent Work on the Apple Maggot in Ontario, by W. A. Ross (pp. 67-72); Insects of the Season in Ontario, by L. Caesar (pp. 75-84); Insect Pests of Southern Manitoba During 1912, by N. Criddle (pp. 97-100); Some New or Unrecorded Ontario Insect Pests, by L. Caesar (pp. 100-105); Notes on Injurious Insects in British Columbia in 1912, by R. C. Treherne (pp. 106-111); and Arsenite of Zinc as a Substitute for Arsenate of Lead, by L. Caesar (pp. 111, 112).

Insects of the year in British Columbia, T. CUNNINGHAM (*Proc. Brit. Columbia Ent. Soc., n. ser., 1911, No. 1, pp. 15-22*).—Brief accounts are given of the occurrence of the more important insect pests in British Columbia during 1911.

Some new and unusual insect attacks on fruit trees and bushes in 1912, F. V. THEOBALD (*Jour. Bd. Agr. [London], 20 (1913), No. 2, pp. 106-116, pl. 1*).—Among some of the more important insects noted are the apple leaf sawfly (*Lygæonematus mæstus*); the beech Orchestes (*Orchestes fagi*), which seriously injured apples; the garden chafer (*Phyllopertha horticola*), observed to attack apples in its adult stage; the V moth (*Halia wawaria*) on currants and gooseberries; the pear leaf curling midge (*Cecidomyia pyri*); the red bug *Atractonotus mali* attacking apples; the ash and willow scale (*Chionaspis salicis*) attacking currants; the sycamore coccus (*Pseudococcus aceris*) attacking apple trees; the delicate strawberry aphid (*Myzus fragariae*); the northern currant aphid (*Rhopalosiphum brittenii*); the dark green Ribes aphid (*Aphis grossulariae*); and a phytoptid attacking apple leaves.

Report on economic zoology for the year ending September 30, 1912, F. V. THEOBALD (*Jour. Southeast. Agr. Col. Wye, 1912, No. 21, pp. 111-221, pls. 17, figs. 33*).—This is the author's annual report (E. S. R., 28, p. 248) on the more important insect pests of the year, which are taken up under the headings of animals injurious to fruit trees and bushes, hops, cereals, pulse, root crops, vegetables, flowers, and forest trees, those causing annoyance to man, and those injurious to furniture, stored food, etc.

A sealed paper carton to protect cereals from insect attack, W. B. PARKER (*U. S. Dept. Agr. Bul. 15, pp. 8, figs. 8*).—This bulletin, based upon observations and experiments made in California, has been summarized by the author as follows:

"Cereals may become infested before they are packed, after the packages are placed in warehouses, and in the grocery stores. Insects find their way in at the small holes which are usually present at the corners of unsealed packages or at holes accidentally punched in the sides. Thorough sterilization at 180° F. kills all insect life; and if the cereal is run from the sterilizer either through a sterile cooler or directly into sterile packages and immediately sealed, it will not become infested unless the package is broken. Sterilization of the knocked-down cartons before packing and cleanliness with regard to the exclusion of insects from the packing room will greatly facilitate the preparation of sterile packages and is strongly recommended. It is absolutely necessary that all machinery connecting the sterilizer and the packages be free from insects. If the cereal is passed through chutes or conveyors which can not be sterilized or are not kept sterile, it will, through these sources, become infested even though the cereal was previously sterile and was packed in sterile packages."

Spontaneous septicemia in the cockchafer and the silkworm due to coccobacilli, E. CHATTON (*Compt. Rend. Acad. Sci. [Paris], 156 (1913), No. 22, pp.*

1707-1709).—In investigations conducted in May, 1912, the author found *Coccobacillus acridiorum* to cause the death of cockchafers in from 24 to 48 hours when injected into the body cavity. When ingested, however, it does not affect the cockchafer.

The author also found a septicemia to be caused by a coccobacillus (*Bacillus melolonthæ*). This is much similar to *C. acridiorum*, but differs in a constant manner both in its morphological and cultural characteristics, including a somewhat greater length and the production of fluorescence in gelatin after cultivation for 5 or 6 days, and also by its pathogenic action on the silkworm. When injected into the body cavity an uncultivated virus killed the cockchafer in from 12 to 24 hours, but when ingested it is innocuous. *B. melolonthæ* was found in the digestive tract of 75 per cent of healthy cockchafers, in some cases in great numbers, as is always the case in septicemic specimens. Thus the septicemia appears to be of intestinal origin, as occurs in the locust. It was found that the silkworm possesses a complete natural immunity against *C. acridiorum*, while *B. melolonthæ* is as virulent in the silkworm as in the cockchafer when injected and as inactive when ingested.

Another coccobacillus (*B. bombycis*) proved to be the cause of a septicemia in the silkworm. During the rearing of some 2,000 worms from 5 to 10 individuals are said to have succumbed daily to this disease. In its morphology this bacillus resembles *B. melolonthæ*, but it does not form fluorescence in gelatin and is clearly differentiated from *C. acridiorum* by its greater virulence. Like *B. melolonthæ* it proves fatal to the silkworm in from 12 to 24 hours when injected into the body cavity. By ingestion the author infected 4 out of 27 individuals. Thus it is more virulent than either *B. melolonthæ* or *C. acridiorum*, but is much less widely distributed and abundant in the digestive tube of healthy silkworms than is *B. melolonthæ* in the cockchafer. See also a previous note (E. S. R., 29 p. 855).

In this disease of the silkworm, which has previously escaped recognition, no external symptoms are noticed before death. The coccobacillosis, as termed by the author, is essentially different from the well-known flacherie, grasserie, and polyhedral body disease.

The coccobacilli infections of insects, F. PICARD and G. R. BLANC (*Compt. Rend. Acad. Sci. [Paris]*, 157 (1913), No. 1, pp. 79-81; *abs. in Rev. Appl. Ent.*, 1 (1913), Ser. A, No. 9, pp. 336, 337).—In further investigations of its pathogenicity (E. S. R., 29, p. 855), *Coccobacillus caja* was found to cause the death of various Coleoptera, Hemiptera, Orthoptera, and Lepidoptera into which it was injected, including the cockchafer, brown-tail moth, silkworm, etc. During the course of examinations made of the gipsy moth, which was unusually abundant in southern France during the year, the authors discovered a coccobacillus, causing a fatal septicemia, which they name *Bacillus lymantriæ*. In investigations conducted it was found possible to kill *Arctia caja* caterpillars with a few drops of a culture of *C. caja* when introduced into the pharynx by means of a pipette without finding a trace of the organism in the blood. It is pointed out that *C. caja*, *B. bombycis*, *B. melolonthæ*, and *B. lymantriæ* differ from *C. acridiorum* in that the last-named is fatal to the locust when ingested but innocuous to the silkworm.

Locust bacterial disease, C. P. LOUNSBURY (*Agr. Jour. Union So. Africa*, 5 (1913), No. 4, pp. 607-611).—This is a report of experiments with *Coccobacillus acridiorum* in which the so-called "elegant grasshopper" (*Zonocerus elegans*), a nonmigratory species, was used as migratory locusts were not available. The results led the author to conclude that this disease at best can be employed only as a supplementary measure in dealing with an invasion of locusts under the conditions that prevail in South Africa.

Fungus diseases of scale insects and white fly, P. H. ROLFS and H. S. FAWCETT, revised by P. H. ROLFS (*Florida Sta. Bul.* 119, pp. 71-82, figs. 19).—A revised edition of Bulletin 94, previously noted (*E. S. R.*, 20, p. 556).

A study of caprification in *Ficus nota*, C. F. BAKER (*Philippine Jour. Sci., Sect. D*, 8 (1913), No. 2, pp. 63-83, figs. 4).—Following a general discussion of the subject, the author describes several new species of fig insects occurring at Los Baños, namely, *Blastophaga nota*, the normal inhabitant of the gall flowers and active capriflier of *F. nota*; *Agaonella larvalis* n. g. and n. sp., common in *F. nota* and probably a guest in its relation to the *Blastophaga*; *Sycophaga nota*, not at all common in gall figs of *F. nota* and apparently a guest; *Sycoryctes philippinensis*, found in great numbers in November in gall figs of *F. nota*, and thought by the author to be a parasite in its relation to the *Blastophaga*; *Philotrypesis similis*, common in *F. nota*; *P. ashmeadii*, frequent in gall figs and probably parasitic on *Blastophaga*; and *P. collaris*, found occasionally in gall figs and probably parasitic on *Blastophaga*.

Synoptic lists of the male and female fig insects found in *F. nota* are appended.

A systematic outline of the Reduviidæ of North America, S. B. FRACKER (*Proc. Iowa Acad. Sci.*, 19 (1912), pp. 217-253).—This paper consists largely of keys to the genera and species of the "assassin bugs" of North America. A bibliography of the more important literature and an index to the genera and species are included.

The British species of the genus *Macrosiphum*, I and II, F. V. THEOBALD (*Jour. Econ. Biol.*, 8 (1913), Nos. 2, pp. 47-94, figs. 30; 3, pp. 113-154, figs. 29).—In the first paper the author deals with 25 species of aphids of the genus *Macrosiphum* which occur in Great Britain, of which 4 are described as new to science. The second paper deals with 35 additional species, of which 8 are described as new to science.

Report of the entomologists, W. E. RUMSEY and L. M. PEAIRS (*West Virginia Sta. Rpt.* 1912, pp. 20-24).—In experiments conducted with a view to perfecting a spray which will destroy the eggs of the apple aphid when applied while the trees are dormant, a block of 31 2-year-old apple trees on the station grounds was made use of. Applications of lime-sulphur 1:8, soluble oil 1:10. Kiloscale 1:10, blackleaf 40 1:20, and nicotin sulphate 1:65 and weaker strengths of all these were made on March 27. The results seem to indicate that commercial lime-sulphur at the strength of from 1:8 to 1:10 if thoroughly applied will destroy the winter eggs of the aphid. In tests made of summer sprays, including soluble oil 1:36 and 1:45, lime-sulphur 1:45, and nicotin sulphate 1:900 applied May 26, and of several combination sprays applied June 7, the nicotin sulphate gave decidedly the best results, killing the aphid without damaging the trees.

The so-called aerostatic hairs of certain lepidopterous larvæ, W. A. RILEY (*Science, n. ser.*, 37 (1913), No. 958, pp. 715, 716).—Attention is called to the fact that it appears to have been very clearly established that the so-called aerophores do not aid in rendering the larvæ more buoyant, but that they contain a poisonous fluid which serves to protect the caterpillars against insectivorous birds.

On the parthenogenesis and oviposition of the potato tuber moth (*Phthorimæa operculella*), F. PICARD (*Compt. Rend. Acad. Sci. [Paris]*, 156 (1913), No. 14, pp. 1097-1099).—When placed with potato tubers the moths were found to oviposit in from 1 to 2 days following mating, from 40 to 80 eggs being deposited within 1 to 3 days. The moth is said to oviposit on a large number of solanaceous plants, on rugous surfaces and in the depressions about the

buds of the tubers, accidental cracks in the surface of the tuber, depressions along the nervures of the leaves, etc.

The author has found parthenogenesis to occur in but 9 cases out of more than 100 which he has observed. Altogether but 23 females and 21 males were produced parthenogenetically by these 9 females, as many of the eggs deposited did not hatch. Forty is said to be the maximum number of eggs deposited by unfertile moths; these moths live much longer than the fertile ones. During July and August the life cycle was passed within a month, but with the parthenogenetic generation from $1\frac{1}{2}$ to 3 months were required for the same development.

The insects of the dipterous family Phoridae in the United States National Museum, J. R. MALLOCH (*Proc. U. S. Nat. Mus.*, 43 (1913), pp. 411-529, pls. 7).—Two genera and 92 species are described as new. The paper includes a list of the species the habits of which are more or less known.

Descriptions of new genera and species of muscoid flies from the Andean and Pacific coast regions of South America, C. H. T. TOWNSEND (*Proc. U. S. Nat. Mus.*, 43 (1913), pp. 301-367).—This paper contains descriptions of 72 species of muscoid flies of South America. See also a previous note (E. S. R., 26, p. 860).

Merodon equestris in southern British Columbia, P. NORMAN (*Proc. Brit. Columbia Ent. Soc., n. ser.*, 1911, No. 1, pp. 22-26).—The narcissus fly (*M. equestris*) is said to have been imported into British Columbia about 6 years ago. The adult is active from the end of March to the beginning of September, but practically all the injury is done during the month of May. Upon hatching out from the egg, which appears to be deposited in the center of the crown of leaves, the larva enters the bulb, where 6 months are passed in the larval stage and where it hibernates. In February it leaves the bulb and pupates about half an inch below the surface of the soil, emerging as an adult toward the end of March.

The southern corn rootworm, or budworm, F. M. WEBSTER (*U. S. Dept. Agr. Bul.* 5, pp. 11, figs. 2).—A summarized account of the literature, together with recent observations of *Diabrotica duodecimpunctata*, its distribution, food plants, injury, habits of the larvæ, oviposition, seasonal history, natural enemies, and remedial and preventive measures.

The western corn rootworm, F. M. WEBSTER (*U. S. Dept. Agr. Bul.* 8, pp. 8, figs. 5).—A summarized account of *Diabrotica longicornis* similar to that of *D. duodecimpunctata* above noted.

The coconut leaf-miner beetle, *Promecotheca cumingii*, C. R. JONES (*Philippine Jour. Sci., Sect. D*, 8 (1913), No. 2, pp. 127-133, pls. 2; *Philippine Agr. Rev. [English Ed.]*, 6 (1913), No. 5, pp. 228-233, pl. 1, fig. 1).—This beetle is said to be a source of injury through feeding, both in the adult and larval stages, upon the leaves of the young coconut. The author here presents an account of its life history and habits and methods of control. Observations have shown that a little over 44 per cent of the larvæ and pupæ and an average of about 5 per cent of the eggs are parasitized.

The occurrence of a cotton boll weevil in Arizona, W. D. PIERCE (*U. S. Dept. Agr., Jour. Agr. Research*, 1 (1913), No. 2, pp. 89-98, pl. 1, figs. 9).—This is a report of studies made by the author during August, 1913, in association with A. W. Morrill, of the Arizona Experiment Station, as to the occurrence of a boll weevil, which had previously been discovered by O. F. Cook and H. B. Wright, and reported by the former (E. S. R., 29, p. 458), as developing upon *Thurberia thespesioides* in Arizona. The weevil has been found to occur in Ventana Canyon, Santa Catalina Mountains, and in Stone Cabin and Sawmill Canyons, in the Santa Rita Mountains, where it breeds commonly upon

T. thespesioides, a plant so nearly like cotton that the Mexicans and natives call it wild cotton.

A close examination of this weevil has disclosed many minor points of difference from the usual form of the cotton boll weevil (*Anthonomus grandis*). The Arizona form may be found in hibernation in cells until September 1, while the eastern form is never found in cells in cotton bolls after March 15. On *Thurberia* the Arizona form seems to be confined to one or not more than two annual generations and is found at an altitude of 4,000 ft. and higher, while the cotton boll weevil has many generations and has never been found above an altitude of 2,000 ft. Experiments have shown that the cotton boll weevil will readily and eagerly feed upon *Thurberia* squares and bolls and that the *Thurberia* weevil will feed upon and develop in cotton squares. It is stated that B. R. Coad has succeeded in rearing undoubted crosses between the two varieties from females of each form, although these hybrid offspring were somewhat undersized.

The evidence presented has led the author to conclude that the two forms represent merely two subspecies, or varieties, or geographic races of a single species, and he here describes the Arizona form as a new variety under the name *A. grandis thurberiae*.

It is not known whether the *Thurberia* weevil hibernates as an adult outside of its cell, but it has been found that many individuals pass the winter and even the summer in the cells formed during the preceding fall. The natural dormant period of the Arizona weevil lasts about 9 months. *Thurberia* weevils extracted from their cells in May and sent to Victoria, Tex., immediately began to feed and develop upon cotton and produced several generations. Thus the *Thurberia* weevil has either acquired by long years of adversity an ability to survive for a longer period without food, assuming *A. grandis* to be the original species, or, if the *Thurberia* weevil is the true original form, then the ability to obtain a plentiful supply of early food has caused the species to lose some of its resistance to adversity. The development of the *Thurberia* weevil on its native host has not been studied, but it has been observed at Victoria on cotton and the period required for its development found to be practically the same as for the cotton boll weevil. *Thurberia* weevils removed from hibernation in June and transplanted on cotton began reproducing at once and continued to do so throughout the season.

The host plant of this new form grows at altitudes of from 2,250 to 7,000 ft. and is found at the bottom of the canyons, on the canyon walls, and on the top of the ridges, growing usually where protected more or less from the greatest heat of the sun. It begins flowering in some localities in July, while in others it is just beginning to bud in the latter part of August. The flowering continues into October. The plants are perennial, growing to over 10 ft. in height with a spread of about 10 ft.

At least two species of parasites, a species of *Cerambycobius* and an undetermined braconid, attack the *Thurberia* weevil in the Santa Rita Mountains.

This new weevil becomes of economic importance in that cotton is now being cultivated under irrigation in several localities in Arizona and in the Imperial and Colorado River valleys in California. *Thurberia* is said to occur in nearly every mountain range in southwestern Arizona where there is any moisture. In the vicinity of the Santa Cruz Valley cotton is grown within 5 miles of *Thurberia* plants, and the weevil was found abundant within not more than 10 miles from such cotton. *Thurberia* is also known to occur in Fish Creek Canyon, one of the sources of the Salt River, in which valley the most extensive cotton plantings in Arizona are found, and in the mountains to the north and south of the Gila River Valley.

Since the weevil will probably cleave to its native food plant until compelled to seek sustenance elsewhere, the author is of the opinion that a wholesale destruction of the native food plant might invite a quicker than natural adaptation to cotton on the part of this weevil. It is thought that the introduction of parasites of the cotton boll weevil would be of considerable assistance in reducing the Arizona weevil and that they would not cause its dispersal. It is pointed out that there is danger of a distribution of weevil-infested buds through the drainage system by summer freshets. Attention is called to the fact that it is of extreme importance that the *Thurberia* weevil be kept out of western Texas and any part of the Southeast, since if accidentally introduced into other sections it might be able to stand much greater variations of climate than *A. grandis* and become a much more powerful enemy of cotton.

Life history of *Otiorhynchus ovatus*, the strawberry root weevil, under lower Fraser conditions, R. C. TREHERNE (*Proc. Brit. Columbia Ent. Soc., n. ser., 1912, No. 2, pp. 41-50; abs. in Rev. Appl. Ent., 1 (1913), Ser. A, No. 3, pp. 92-94*).—This insect is reported to have caused considerable loss to growers in the lower Fraser Valley and those sections of British Columbia along the Pacific coast where strawberries are grown commercially. It does not appear to attack the crown but feeds on the roots of the plant only, the larva having been found from 6 to 8 in. below the surface. It is said to be far more numerous than is *O. sulcatus*.

The incubation period of the egg is about 21 days, the length of the larval stage at least 7 months, and of the pupal stage from 21 to 24 days. The larva is more or less omnivorous, having been taken in clover and timothy grass sod, on wild strawberry from sea level up to an elevation of 500 ft., on the roots of the peach, on rhubarb, *Rumex acetosella*, *Potentilla glandulosa*, *Balsamorhiza sagittata*, *Poa scrotina*, and *P. pratensis*; it has also been found in potato fields, though there is no direct proof of its attacking potato. The larvae attack the plant roots by making longitudinal slits in portions of the epidermis, subsequently girdling the roots either directly or in a spiral manner. The most serious injury is done in early spring when the larvae are nearly full grown and attack the main roots, which are sometimes cut off 2 in. or so from the crown.

The pupal stage is passed at from 4 to 6 in. or even 8 in. below the surface. The female deposits some 50 eggs within a period of 4 to 5 days; this period may be extended to as long as 15 days. Oviposition takes place from the end of June to the end of August, varying somewhat according to the season.

Strawberries grown on the matted row system are not as a rule seriously affected the first year after planting, unless the soil was previously infested by the insect. The injury is noticeable the third summer, often reducing the crop fully 50 crates to the acre.

The following remedial measures are suggested: The growth of strong varieties; the running of chickens over the grounds; trapping the adult weevils under boards (only useful to small growers); the use of some sticky material as traps; spraying with arsenate of lead (only useful after the first crop is harvested and when the weevils are very numerous); chemical remedies, potassium cyanid and carbon bisulphid, but the author is doubtful whether any remedy of this kind can be used to kill the eggs, larvae, or adults which will not at the same time destroy the plant; burning the plants immediately after the first crop has been gathered by covering them with dry straw and setting fire to it; plowing at the end of July or at the beginning of August, with frequent cultivation previous to or during the winter; autumn planting; plant renewal during the middle of the second summer; and 1-year crops instead of 2-year crops, though this is not satisfactory. Rotation of crops is strongly advocated in the following order, derived from local experience—strawberries, potatoes, and rhubarb.

Not more than 1 acre in 10 should be laid down to strawberries in an infected locality.

Annual report of the Bee-Keepers' Association of the Province of Ontario, 1912 (*Ann. Rpt. Bee Keepers' Assoc. Ontario, 1912*, pp. 72).—This consists of the proceedings of the annual meeting, held at Toronto in November, 1912.

The Bombidæ of the New World, II, H. J. FRANKLIN (*Trans. Amer. Ent. Soc.*, 39 (1913), No. 2, pp. 73-200, pls. 22).—This second part of the work previously noted (*E. S. R.*, 28, p. 758) deals with the species occurring south of the United States. Tables are given for the determination of queens, workers, and males of American species of *Bombus* south of the northern boundary of Mexico, of which 9 species are described as new to science. It is stated that females and males of but 2 species of *Psithyrus* each have so far as known been collected in the New World south of the United States, one of the males having not hitherto been described. A list of unclassified names and descriptions is appended.

Studies in the wood wasp superfamily Oryssioidea, with descriptions of new species, S. A. ROHWER (*Proc. U. S. Nat. Mus.*, 43 (1913), pp. 141-158, pls. 2, figs. 6).—This contribution from the Bureau of Entomology of this Department deals with the habits, geographical distribution, external anatomy, relationships, and classification of the superfamily.

A study in insect parasitism, R. L. WEBSTER (*Proc. Iowa Acad. Sci.*, 19 (1912), pp. 209-213).—This paper reports studies made at the Iowa Experiment Station of parasitism of the southern tobacco worm (*Phlegethontius sexta*), a pest commonly met with in Iowa on the tomato and potato.

The braconid *Apanteles congregatus*, its most common primary parasite, was found to be highly parasitized by the two hyperparasites *Mesochorus luteipes* and *Hypopteromalus viridescens*. Six different lots consisting of a total of 2,303 *Apanteles* were collected from September 7 to October 18. *Apanteles* developed from 1,112, *Hypopteromalus* from 779, and *Mesochorus* from 27, leaving 475 from which nothing was reared.

A revision of the Ichneumonidæ based on the collection in the British Museum (Natural History), with descriptions of new genera and species, C. MORLEY (*London, 1913*, pt. 2, pp. IX+140, pl. 1).—This second part of the work previously noted (*E. S. R.*, 27, p. 662) deals with the tribes Rhyssides and Echthromorphides of the subfamily Pimplinæ and Anomalides and Paniscides of the subfamily Ophioninæ.

Descriptions of new Hymenoptera, V, J. C. CRAWFORD (*Proc. U. S. Nat. Mus.*, 43 (1913), pp. 163-188, figs. 2).—Among the 2 genera and 30 species here described as new to science are *Eurytoma piura* and *Cerambycobius townsendi*, both reared from the Peruvian cotton square-weevil (*Anthonomus vestitus*) in Peru; *Coccidoctonus trinidadensis*, reared from *Pulvinaria pyriformis* on honey-suckle in Trinidad; *Spintherus pulchripennis*, reared from *Pissodes* sp. at Columbia Falls, Mont.; *Cecidostiba ashmeadi*, a parasite of *Polygraphus rufipennis* at Morgantown, W. Va.; *Cecidostiba thomsoni* from *Pissodes* sp., at Columbia Falls, Mont.; *Catolaccus townsendi* from *A. vestitus* in Peru; *Chrysocharis parksi*, *C. ainsliei*, *Closterocerus utahensis*, *Pleurotropis rugosithorax*, *Derosia punctiventris*, and *Diaulinus begini*, reared from Diptera of the genus *Agromyza* at Salt Lake City, Utah; *Closterocerus winnemana*, reared from the eggs of *Arge salicis* at Plummer's Island, Maryland; *Diaulinopsis callichroma* and *Diaulinus websteri*, both reared from *Agromyza jucunda* at Tempe, Ariz.; and *Comedo hookeri*, reared from *Pyrophila pyramidoides* at Vienna, Va.

Descriptions of one new family, eight new genera, and thirty-three new species of ichneumon flies, H. L. VIERECK (*Proc. U. S. Nat. Mus.*, 43 (1913), pp. 575-593).—Among the species of economic importance here described as new

to science are *Meteorus archipsidis*, reared from *Archips argyrospila* at Bethany Center, N. Y.; *Rogas laphygmae*, reared from *Laphygma frugiperda* at Brownsville, Tex.; *Angitia plutella*, reared from *Plutella omissa* at Rocky Ford, Colo.; *Campoplex epinotiae*, reared from *Epinota aretostaphylina* at Carmel, Cal.; *C. polychrosidis*, reared from *Polychrosis carduiana* at Hyattsville, Md.; *Cymodusa aristoteliae*, parasitic on *Aristotelia pudibundella* at Kirkwood, Mo.; *Herpestomus hyponomeuta*, reared from *Hyponomeuta malinellus* in Japan; *Hypotherentes nigrolincatus*, a parasite of *Heliophila albilinea* at Springer, N. Mex.; etc.

Notes on sawflies, with descriptions of new species, S. A. ROHWER (*Proc. U. S. Nat. Mus.*, 43 (1913), pp. 205-251, figs. 6).—Several of the species here described as new are of economic importance, including *Arge salicis*, the larva of which was taken from *Salix niger*, at Plummer's Island, Maryland; *Diprion grandis*, the larvæ of which feed on *Pinus serotulorum*, at Crawford, Nebr.; and *Perclista quercus*, which defoliates white oaks at Forest Hills, Mass.

The life history of *Ixodes angustus*, S. HADWEN (*Proc. Brit. Columbia Ent. Soc., n. ser.*, 1911, No. 1, pp. 37, 38).—This tick, although found on a variety of animals, in British Columbia occurs principally on squirrels (*Sciurus hudsonius douglasi* and *S. hudsonius vancouverensis*). The life cycle is said to be passed in 221 days.

FOODS—HUMAN NUTRITION.

The municipal abattoir, R. M. ALLEN and J. W. McFARLIN (*Kentucky Sta. Bul.* 173, pp. 213-265, pls. 7, figs. 6).—In connection with the Kentucky state pure food and drug work, an inspection has been carried on of slaughterhouses and meat markets throughout the State, as well as investigations to determine the best remedy for the conditions found, since these could not be controlled by the pure food law and the general health statutes of the State or by the existing city ordinances.

The bulletin makes a strong plea for the municipal abattoir and discusses such questions as building and equipment, city and private ownership, license and inspection fees, the municipal abattoir under the United States laws, and needed state legislation. A proposed ordinance for municipal abattoirs is given and Kentucky plans for a model abattoir. Offal waste, the relation of the municipal abattoir problem to breeder and feeder, and systems of meat inspection are considered and the results of a recent meat conference in Louisville presented. It is stated that since the municipal abattoir question has been under consideration decided change has been noted in the sanitary condition of Kentucky slaughterhouses.

The results of the investigation lead to the conclusion that the "municipal plants should be organized only to the extent of economical and efficient inspection. It would seem that the extent of centralization for inspection can well follow that amount of trade cooperation among the butchers necessary to establish economical slaughtering, refrigeration, tankage, and similar trade advantages. One plant, killing a few animals, can not afford the overhead investment and running expense of modern refrigeration and adequate tankage facilities. A group of butchers can install such equipment, at a great saving to each individual, and thus we should be able to yoke together the necessity for trade economy and cooperation with the necessity for centralized inspection.

"One outstanding point for such investigation is the fact that the wasteful and costly methods on the part of the local butcher, such as the giving away of offal, the purchase and hauling of ice, lower prices for carelessly handled hides and tallow, from small plants and through several middlemen, and the

maintenance of plants and labor, for a few animals, capable of greatly increased slaughtering, afford little or no element of economic competition from the unorganized, uninspected local meat supplies, and these economic errors have a substantial and direct influence in fixing the high meat prices."

Emaciation in meat inspection, F. GRÜTNER (*Ztschr. Fleisch u. Milchhyg.*, 23 (1913), No. 20, pp. 467-473).—It is the opinion of the author that the whole animal body should be regarded as unfit for human food if complete emaciation has taken place, and that its value as human food is very considerably reduced if emaciation has taken place to any great extent.

The presence of succinic acid in meat extracts and in fresh meat. H. EINBECK (*Hoppe-Seyler's Ztschr. Physiol. Chem.*, 87 (1913), No. 2, pp. 145-158).—The examination of several samples of commercial beef extracts showed the presence of succinic acid in amounts varying from 0.3 to 0.5 per cent. The amount of succinic acid in several samples of fresh beef varied from 0.1 to 0.5 per cent.

Muscle extractives.—XIV, Carnosin and carnosin nitrate, W. GULEWITSCH (*Hoppe-Seyler's Ztschr. Physiol. Chem.*, 87 (1913), No. 1, pp. 1-11).—Experimental data are given regarding the optical properties of carnosin and carnosin nitrate which were obtained in pure form from meat extractives. For earlier work, see previous notes (E. S. R., 18, pp. 67, 1067; 19, p. 64).

Muscle extractives.—XV, The presence of carnosins, methylguanidins, and carnitins in horseflesh, J. SMORODINZEW (*Hoppe-Seyler's Ztschr. Physiol. Chem.*, 87 (1913), No. 1, pp. 12-20).—The examination of muscle from a freshly killed horse showed the presence of these substances in the following amounts: Carnosin, 1.82; methylguanidin, 0.83; and carnitin, 0.2 per cent.

Fish milt as human food, J. KÖNIG and J. GROSSFELD (*Biochem. Ztschr.*, 54 (1913), No. 5-6, pp. 333-350).—The results are presented of a study of the composition of herring milt and carp milt, special reference being made to the nature of the nitrogenous and fatty constituents.

Among the nitrogen compounds found were the meat bases, xanthin and creatinin, free amino acids, and protamin in combination with nucleic acid. The fat contained about 20 per cent lecithin and from 11 to 17 per cent of cholesterolin.

Fish roe as human food, J. KÖNIG and J. GROSSFELD (*Biochem. Ztschr.*, 54 (1913), No. 5-6, pp. 351-394, pls. 2, fig. 1).—A study was made of the chemical composition of several varieties of fish roe, including among others that of herring, carp, pike, and cod. Several varieties of caviar were also studied.

The fish roe showed a low water content. Among the meat bases found were xanthin and creatin, and among the free amino acids taurin, *l*-tyrosin, and glycocoll. The proteins were rich in sulphur and phosphorus, but protamin was found. The fat showed a high content of lecithin, nearly 60 per cent, and from 3 to 14 per cent of cholesterolin. The lecithin content was highest in the case of the roe with a low fat content. The sulphur and phosphorus were present in organic combination.

Lacto—a frozen dairy product, M. MORTENSEN and B. W. HAMMER (*Iowa Sta. Bul.* 140, pp. 149-155).—This bulletin contains data reported in an earlier publication (E. S. R., 25, p. 63) and new material which has accumulated, including a discussion of the general question of the souring of the milk.

Recent experiments with *Bacillus bulgaricus* show that this organism is capable of forming considerably more acid than the organism ordinarily used as a starter, so the acid fermentation should be watched. By ripening the milk so that it has an acidity of 0.9 per cent, good products, according to the authors, can be obtained with the formulas given. Sometimes this organism gives a disagreeable flavor to the milk which can be overcome in part at least

by the use of the ordinary lactic acid used by the butter maker in conjunction with *B. bulgaricus*.

"The growth of *B. bulgaricus* results in a slimy condition of the milk, the sliminess being so marked with some cultures that the milk can be pulled out in strings several feet long. This stringy condition can be greatly reduced or entirely eliminated by violent agitation. Although this slimy condition is objected to by some persons when the milk is to be used as a drink, it is an advantage when the milk is to be used for making lacto because it improves the body of the product to a considerable extent.

"*B. bulgaricus* grows best at a temperature considerably higher than the temperature ordinarily used for propagating starters. While the best temperature is not exactly known it probably lies above 100° F. A temperature of 99° F., which is one of the temperatures commonly employed in bacteriological laboratories, gives very good results. Cultures can be propagated at room temperatures, but growth is quite slow. . . . If exceptionally clean milk is available, little trouble should be experienced when careful pasteurization is practiced, but if the milk is badly contaminated considerable difficulty is likely to be encountered. An exposure to a steam pressure of 5 lbs. for 15 minutes gave good results with milk that was highly contaminated and with which pasteurization at 180° F. for 2 hours was of no avail in stopping the undesirable changes. . . .

"Another method commonly employed in laboratories consists in heating the milk to the temperature of boiling water for from 20 to 40 minutes on each of 3 successive days. In this procedure, the bacterial spores are supposed to germinate between heatings and, in the vegetative stage, the micro-organisms are killed by the succeeding exposure. This continued heating of course darkens the milk and imparts a cooked taste, but the cooked taste is not as noticeable after fermentation with *B. bulgaricus* as before. . . .

"In various places in the United States a certain micro-organism has been found that is closely related to *B. bulgaricus*. This bacterium produces more acid than the organisms used for starter making, although not so much as *B. bulgaricus*. Moreover, some of the cultures are slimy. Milk fermented by it has an exceptionally clean acid flavor. This organism has also been used to ferment milk for making lacto and an excellent product obtained. It is rather difficult to propagate without the facilities of a laboratory."

Composition and nutritive value of "taralli", a special bread made in Naples, A. CUTOLO (*Bol. Soc. Nat. Napoli*, 2. ser., 24 (1910), pp. 158-164).—Analytical data are given, together with a description of the methods of analysis, and the product is compared with other breads as to composition and nutritive value.

A digestion experiment with banana meal, KAKIZAWA (*Arch. Hyg.*, 80 (1913), No. 7-8, pp. 302-309).—The experiment described was divided into 4 periods of 3 days each. The subject was maintained upon a diet of milk, bread, sausage, cheese, sugar, and butter which furnished a daily ration of approximately 74 gm. protein, 117 gm. fat, and 186 gm. carbohydrate. The greater part of the bread was replaced by banana meal in the second period and by oatmeal in the fourth period.

The coefficient of digestibility of the total dry substance in the food was 90.8 per cent during the banana meal period, 91.9 per cent during the oatmeal period, and 92.3 and 92.6 per cent in the 2 periods where bread was the chief source of carbohydrate. The proportion of the total nitrogenous material in the diet digested during the banana meal period was 88.9 per cent; during the oatmeal period, 86.2 per cent; and during the 2 other periods, 88.3 and 87.6 per cent.

On the nature of the sugars found in the tubers of arrowhead, K. MIYAKE (*Jour. Biol. Chem.*, 15 (1913), No. 2, pp. 221-229).—It was found in the experiments here reported that arrowhead tubers contained both glucose and fructose. The nonreducing sugars were found to consist of sucrose and a sugar which appeared to be raffinose. No evidence was found of the presence of maltose, pentose, and mannose, either free or combined.

Studies on the factors affecting the culinary quality of potatoes, O. BUTLER, F. B. MORRISON, and F. E. BOLL (*Jour. Amer. Soc. Agron.*, 5 (1913), No. 1, pp. 1-33, figs. 4).—In this investigation the effect of chemical composition, structure, and methods of cooking and storage on the cooking quality of potatoes was studied. A number of different varieties of potatoes were included in the investigation, each variety being baked, steamed, boiled, and fried. The factors noted in passing upon the quality of the cooked product were discoloration, mealiness, sweetness, and bitterness, the value given to each quality being recorded on the score card. The methods of cooking, judgment of the product, and chemical analysis are discussed in detail. The conclusions drawn are as follows:

Potatoes high in water content are less mealy than those of a relatively low water content. Neither the percentage of starch in a potato nor the ratio of albuminoid nitrogen to starch is indicative of the degree of mealiness. "The presence of sugar in a potato is detrimental to its quality. The percentage, however, that may be tolerated varies with different varieties. The ratio of total nitrogen to starch is no criterion of quality." The degree of development of the tuber is not correlated with quality or mealiness. Fried potatoes are regarded as of better quality than those cooked by any other method, while the quality of boiled and steamed potatoes is about the same.

It is claimed by the authors that the quality of boiled potatoes is affected by the temperature at which they have been stored to a greater degree than are potatoes cooked in any other way. Potatoes of fair or poor quality are best stored at 20° C., and the quality of all potatoes is injured by storing at as low temperatures as 1 to 5° C. "Potatoes for culinary purposes should be stored in a dry cellar at 8 to 10° C."

The authors claim that mealiness in the potato is due to the separation of the cells in cooking rather than to their disintegration due to the swelling of the starch grains.

Chemistry of the household, MARGARET E. DODD (*Chicago, 1911, pp. 12+169, pls. 12, figs. 31*).—A discussion is given of some of the chemical principles involved in the more common processes of the household, including the chemistry of water, combustion and fuels, lighting, foods, cooking, laundry, cleaning, etc.

Handbook of hygiene.—III, Food and nutrition, edited by T. WEYL (*Handbuch der Hygiene*.—3. Band, *Nahrungsmittel und Ernährung*. Leipzig, 1913, 2. ed., pp. [VIII]+297+XII+298-478+VI+479-593, figs. 55).—Parts 1 and 2 have already been noted (*E. S. R.*, 23, p. 461). Parts 3 and 4 (pp. 298-593) contain, respectively, Hygiene of Nutrition of Individuals and Groups, by W. Schumburg, and Hygiene of the Alcohol Question, by A. Delbrück, and the general index to the whole volume.

A further contribution to the knowledge of beri-beri, W. CASPARI and M. MOSZKOWSKI (*Berlin. Klin. Wchnschr.*, 50 (1913), No. 33, pp. 1515-1519).—The results are reported of a metabolism experiment in which one of the authors subsisted for several months on a diet the chief constituent of which was polished rice.

Symptoms were developed which suggested the cardiac form of beri-beri, but disappeared very shortly after a small amount of extract of rice bran was added to the diet.

Control experiments were carried out at the same time with pigeons and animals, under the same conditions, and gave similar results. In these experiments evidence was found which pointed to a great destruction of albumin, which the authors claim could only be explained as the result of severe intoxication. This they claim is confirmed by experiments in which birds were maintained in good health for several months upon a diet consisting of hen's eggs, with small amounts of salt and sugar. When polished rice was added to the egg diet in the case of a part of the pigeons, every one of those receiving the polished rice developed symptoms of beri-beri, while the control animals which received only the egg diet developed no such symptoms.

The authors conclude from these results that beri-beri is not due to the lack of some substance in the diet, but to the presence of some toxic substance, and is therefore an intoxication. The beneficial results obtained by the use of purgatives by other authors in an experimental study of beri-beri are in accord with this view.

A typhoid outbreak apparently due to polluted water cress (*Engin. News*, 70 (1913), No. 7, p. 322, fig. 1).—A report of an epidemic of typhoid fever which was apparently caused by eating polluted water cress is given.

Lessons from a probable water cress typhoid outbreak (*Engin. News*, 70 (1913), No. 7, pp. 311, 312).—The necessity for greater care to prevent the contamination of vegetable foods which are to be eaten in an uncooked condition is emphasized. See abstract above.

The relation of growth to the chemical constituents of the diet, T. B. OSBORNE and L. B. MENDEL (*Jour. Biol. Chem.*, 15 (1913), No. 2, pp. 311-326, figs. 7).—Experiments are reported in continuation of previous work (E. S. R., 25, p. 864; 28, pp. 863, 864).

Animals fed upon a diet of purified protein, starch, lard, and protein-free milk, which had grown abnormally for some time and then ceased to grow and declined, were restored to a satisfactory condition of growth by the use of milk or by replacing a part of the lard in the diet with unsalted butter. The work is to be continued.

Studies on the metabolism of ammonium salts, I, II, III (*Jour. Biol. Chem.*, 15 (1913), No. 2, pp. 327-335, 337-339, 341-355).—This includes 3 papers.

I. *The elimination of ingested ammonium salts in the dog upon an adequate mixed diet*, F. P. Underhill (pp. 327-335).—It was found in these experiments that the ingestion of the ammonium salts of several organic acids failed to increase the amount of ammonia nitrogen excreted in the urine, while under comparable conditions the ingestion of the ammonium salts of several inorganic acids caused an increase in the output of ammonia nitrogen, which varied with the different acids. No explanation is given for this temporary retention of the ammonium salts. All of the inorganic ammonium salts tested and some of the organic ammonium salts caused an increase of the total nitrogen excretion above the normal and temporarily stimulated nitrogen catabolism. Sodium chlorid caused a lowering of the amount of ammonia nitrogen eliminated.

II. *A note on the elimination of ingested ammonium salts during a period of prolonged inanition*, F. P. Underhill (pp. 337-339).—The ingestion of ammonium carbonate by a starving animal failed to cause any increase in the urinary excretion of ammonia nitrogen. Ammonium chlorid, however, caused a distinct increase in the output of ammonia nitrogen as well as of total nitrogen. The output of both ammonia nitrogen and total nitrogen remained for some time at a high level.

III. *The utilization of ammonium salts with a nonnitrogenous diet*, F. P. Underhill and S. Goldschmidt (pp. 341-355).—In the case of dogs maintained upon a nonnitrogenous diet of high energy value the ingestion of ammonium

chlorid showed no retention of nitrogen. This is contrary to the results obtained by other workers. The conclusion is reached that ammonium chlorid is incapable of acting as a source of nitrogen supply for the body. It would appear from these experiments that in considering the influence of ammonium salts upon metabolism distinction must be made between the organic and the inorganic ammonium salts.

The amount of indol obtained by artificial digestion and decay of different proteids, W. VON MORACZEWSKI (*Biochem. Ztschr.*, 51 (1913), No. 4, pp. 349-354).—The author determined the quantity of indol obtained from artificial digestion of casein, the effect of sugar, fat, etc., upon the amount formed, and particularly the conditions of indol formation, namely, pancreatic digestion and putrefaction. Other proteid substances, including thymus, egg white, egg yolk, serum globulin, lactalbumin, fibrin, brain, edestin, meat of different sorts, lentils, etc., were subjected to digestion and to putrefaction and the quantities of indol specific for each were measured.

The influence of the diet on the excretion of indol and indican by healthy men, W. VON MORACZEWSKI and E. HERZFELD (*Biochem. Ztschr.*, 51 (1913), No. 4, pp. 314-339).—The amount of substance giving an indol reaction obtained from urine by distillation was compared with the indican content of the urine on different diets. An increase was noted on a fat, a vegetable, and a gelatin diet, and a decrease on a carbohydrate and a sugar diet. Adding protein caused an increase as compared with carbohydrate and a decrease as compared with fat.

The indol was determined directly in the feces and also after fermentation. The quantity obtained in both cases was increased by fat and also by a diet rich in protein, while carbohydrates diminished indol in both portions and vegetables protected protein from putrefactive changes. The nitrogen and chlorids of the feces showed the same relation. A direct connection between the indican of the urine and the indol of the feces was often noted, both increasing or diminishing at the same time.

The influence of starvation upon the creatin content of muscle, V. C. MYERS and M. S. FINE (*Jour. Biol. Chem.*, 15 (1913), No. 2, pp. 283-304).—Numerous experiments are reported which are a continuation of previous work (*E. S. R.*, 28, p. 865).

During the early part of starvation the creatin concentration of the muscle is increased, but it decreases at the close of the period, owing to the great loss of creatin in the urine during starvation due to decomposition of the muscle tissue. It is the opinion of the authors that the evidence in support of the view that creatin and creatinin are independent in metabolism is weaker than that in support of the view that urinary creatinin is derived from the muscle creatin.

The influence of carbohydrate feeding upon the creatin content of muscle, V. C. MYERS and M. S. FINE (*Jour. Biol. Chem.*, 15 (1913), No. 2, pp. 305-310).—Experiments with animals which were fed almost exclusively upon carbohydrate for varying periods of time showed that the effect of carbohydrate feeding upon the creatin content of the muscle is very similar to that observed in starvation. After a long period of carbohydrate feeding an even greater reduction in the creatin content of the muscle than that which occurs in starvation may be observed. The decreased elimination of creatin after carbohydrate feeding is due to the sparing action of carbohydrate on protein metabolism.

Calorimetry of the work of the kidneys, F. TANGL (*Biochem. Ztschr.*, 53 (1913), No. 1-2, pp. 36-40).—Experiments carried out with the calorimeter, described in the following article, indicated that 8.2 per cent of the total heat

production of the animal body could be attributed to the work of the kidneys, in the case of the rat, and 7.9 per cent in the case of the dog.

A calorimeter for small animals, F. TANGL (*Biochem. Ztschr.*, 53 (1913), No. 1-2, pp. 21-35, figs. 3).—A description is given of a small calorimeter of the open-circuit type which consists essentially of two small copper cylinders inserted in Dewar flasks, which, in turn, are inclosed in a copper box with cork insulation.

The difference in temperature between the two cylinders is measured by means of thermoelectric junctions connected to a galvanometer. One of the cylinders contains a rheostat and in the other is placed the animal whose heat production is to be studied. During an experiment electricity is supplied to the rheostat to generate a quantity of heat sufficient to compensate that given off by the animal in the other cylinder, and thus the two cylinders are kept at the same temperature. The amount of heat produced by the subject is determined from the amount of current supplied to the rheostat.

Provision is also made for the measurement of the carbon dioxide and water vapor produced during the experiment, so that the instrument may serve both as calorimeter and respiratory apparatus.

Micro-calorimeter for the determination of the heat production of bacteria, K. VON KÖRÖSY (*Hoppe-Seyler's Ztschr. Physiol. Chem.*, 86 (1913), No. 5, pp. 383-400, figs. 2).—A description is given of a micro-calorimeter which utilizes the heat of vaporization of ether as a means of indicating the heat production. The number of calories developed by the subject is measured directly by the amount of ether distilled over during the experiment.

ANIMAL PRODUCTION.

The measurement of the intensity of inbreeding, R. PEARL (*Maine Sta. Bul.* 215, pp. 123-138).—In this treatise is presented "a general method of measuring the intensity or degree of the inbreeding practiced in any particular case." On the basis that "the inbred individual possesses fewer different ancestors than the maximum possible number," the author presents the following formula for determining a coefficient of inbreeding:

$$Z_n = \frac{100 (p_{n+1} - q_{n+1})}{p_{n+1}}$$

in which p_{n+1} denotes the maximum possible number of different individuals involved in the matings of the $n+1$ generation and q_{n+1} the actual number of different individuals involved in these matings. It is evident that the coefficient of inbreeding Z is the percentage of the difference between the maximum possible number of ancestors and the actual number realized. In this method the author starts with the individual in question and works backward, assuming that all the different individuals are entirely unrelated until the contrary is proved by the finding of a common ancestor.

In the mating of brother with sister for a series of generations, it is shown that "in the last 2 ancestral generations \times is 50 per cent inbred; in the last 3 generations it is 75 per cent inbred; and in the last 4 generations it is 87.5 per cent inbred." After the seventh generation there is relatively little change made by further generations of this sort of breeding. It is shown that "while increase in intensity of inbreeding is not so rapid in the first few ancestral generations by parent \times offspring type of breeding as with brother \times sister type, by the time the tenth ancestral generation is reached the values are, for practical purposes, the same."

In actual pedigree work the method of calculation consists in determining the primary reappearance of individuals, by which is meant a reappearance as the sire or dam of an individual which has not itself appeared before in the lower ancestral generations. These primary reappearances, together with all the foregoing ancestors which they involve, are then enumerated for each generation and the consequent additions substituted in the $(p_{n+1}-q_{n+1})$ position of the formula, while the maximum possible number of ancestors for the particular ancestral generation involved is substituted for p_{n+1} . The result shows the percentage of inbreeding. The author demonstrates the relation of the coefficients of inbreeding to the hereditary constitution of the individual.

It is believed that this method "is equally applicable to all pedigrees and to all degrees and types of inbreeding"; and that "the proposed coefficients of inbreeding may be made extremely useful in studies of the problem of the effect of inbreeding, whether in relation to its purely theoretical aspects, or in the practical fields of stock breeding and eugenics."

A contribution toward an analysis of the problem of inbreeding, R. PEARL (*Amer. Nat.*, 47 (1913), No. 562, pp. 577-614, figs. 2).—This article is an elaboration on material reported above.

The feeding of farm animals, O. KELLNER (*Die Ernährung der Landwirtschaftlichen Nutztiere*. Berlin, 1912, 6. ed., rev. and enl., pp. XII+640).—This is the sixth edition of this treatise, revised and enlarged (E. S. R., 17, p. 63). It comprises a very comprehensive study of the feeding of domestic animals and includes summarized accounts of feeding experiments previously reported from other sources.

The development of agricultural feeding knowledge, F. HONCAMP (*Landw. Vers. Stat.*, 79-80 (1913), pp. 1-70).—In this treatise the author outlines in a general way the work of the various German investigators in animal nutrition and the various steps in the development of general feeding knowledge.

Results of nuclein feeding of animals (*Tierärztl. Zentbl.*, 36 (1913), Nos. 25, pp. 384-389; 26, pp. 401-405).—A special feed (lavocat), rich in nuclein and of a high phosphorus content, when fed to horses and cattle proved of value as a stimulant and body builder. This was especially true of old horses, young calves, and animals affected with digestive ailments.

[The value of calcium chlorid in animal production], R. EMMERICH and O. LÖEW (*Deut. Landw. Tierzucht*, 17 (1913), No. 28, pp. 333-335).—Experiments in feeding calcium chlorid to calves and pigs resulted in an increase in weight of from 10 to 25 per cent as compared with animals on feeds lacking in this element. In these experiments the calcium chlorid was added to the drinking water, and the feed included fish meal and skim milk, both relatively high in calcium.

On the values of feeding materials, F. MACH (*Landw. Vers. Stat.*, 79-80 (1913), pp. 815-846, fig. 1).—This reports analyses of sesame cake, poppy cake, palm-seed cake, oil cake, and rice meal, with comments and tables on the relative market value of these and other concentrate feeds as determined by their feeding value.

Inspection of commercial feeding stuffs, P. H. SMITH and C. L. BEALS (*Massachusetts Sta. Bul.* 146, pp. 3-61).—This bulletin contains analyses and discussion of the following commercial feeding stuffs: Cotton-seed meal, linseed meal, gluten meal, gluten feed, distillers' dried grains, malt sprouts, brewers' dried grains, wheat middlings, wheat bran, rye feeds, molasses feeds, calf meals, puffed wheat, corn meal, ground oats, rye meal, hominy meal, provender, dried beet pulp, corn bran, meat scraps, meat and bone meal, blood meal, fish meal, milk albumin, alfalfa meal, and proprietary mixed feeds.

There is included a tabulation of wholesale market prices of commercial feeding stuffs for 1912-13.

Inspection of feeding stuffs (*New York State Sta. Bul.* 366, pp. 235-356).—This bulletin contains analyses of the following commercial feeding stuffs: Cotton-seed meal, linseed meal, malt sprouts, dried distillers' grains, dried brewers' grains, gluten meal, gluten feed, corn bran, hominy feeds, mixed and proprietary feeds, molasses feeds, cotton-seed feeds, poultry and animal feeds, beef scrap, tankage, alfalfa meal, dried beet pulp, peanut bran and meal, buck-wheat by-products, corn meal, pea meal, wheat middlings, rolled oats, ground bread, wheat bran, puffed rice, puffed wheat, shredded wheat waste, cob meal, and miscellaneous mixed and proprietary feeds.

There is included a report of tests of the percentage of sand found in feeds compounded with screenings, from 0.13 to 4.2 per cent being found. The text of the New York State law relating to the sale and inspection of feeding stuffs and other data are also given.

Studies in the blood relationship of animals as displayed in the composition of the serum proteins.—II, A comparison of the sera of the ox, sheep, hog, goat, dog, cat, and guinea pig with respect to their content of various proteins, J. H. WOOLSEY (*Jour. Biol. Chem.*, 14 (1913), No. 5, pp. 433-439).—The following table summarizes the average results obtained in a comparison of the sera of various animals:

Proportions of the various proteins in animal sera.

Kind of protein.	Ox serum.	Sheep serum.	Hog serum.	Goat serum.	Dog serum.	Cat serum.	Guinea pig serum.
	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
"Insoluble" globulin.....	8.1	6.4	6.0	6.5	7.7	6.5	4.2
Total globulin.....	29.0	17.0	36.0	22.0	18.0	30.0	16.0
Total albumin.....	70.0	82.0	64.0	75.0	81.0	69.0	84.0

Notes on native live stock, J. B. THOMPSON (*Guam Sta. Rpt.* 1912, pp. 8-22, pls. 4, figs. 5).—The native stock of Guam is of an inferior grade due to a lack of care and to indiscriminate inbreeding. The prevailing type is the straight-backed, humpless *taurus* species, with occasional indications of zebu intermixture. The cattle are employed for draft, carriage, saddle, beef, and dairy purposes. Their milk-producing qualities are inferior, due to a lack of nitrogenous feed and little effort to develop dairy strains. The native cattle have good active grazing habits and fatten easily on pasture. They are hardy and well adapted to climatic conditions.

The prospects for success in cattle raising are deemed good, owing to the demand for beef, prices paid, the large areas of grazing land, the green feed available throughout the year, and the tropical climate. No contagious or infectious diseases are observed among cattle in Guam, and although both the Texas cattle tick and Australian cattle tick are present, the native cattle are immune to Texas fever. A former intermixture of Jersey blood resulted in materially improved dairy stock.

Weights and body measurements of Guam cattle and carabao are reported. The native carabaos do not withstand heat as well as do cattle. They are lower in body temperature, 373 showing an average temperature of 100.7° F., but under exertion, a rapid rise in temperature is noted, 26 animals averaging 104.7° on a hot day in June. For heavy draft work in the mud, the carabao

has no equal, while they are also used for beef and milk, yielding a fair amount of milk rich in fat.

Horses are scarce and the offspring of a poor grade of stock introduced from the Philippines. The domesticated hogs are of 2 types: First, the long, lean, slow-maturing kind, the sows being prolific and good mothers; second, the short, fine-boned, early-maturing type probably from Chinese or Japanese stock, the sows bearing small litters and being poor mothers.

The native chickens are of mixed breeds. They are somewhat larger than the Leghorn, but are poor egg layers. There is a ready demand for both eggs and fowls in the island. Chicken pox and other serious infectious diseases are prevalent.

Pure-bred stock was imported by the station in 1911 from the United States, consisting of 2 Ayrshire bulls and 2 heifers, 4 Morgan fillies and 2 stallions, 2 Berkshire sows and 2 boars, and a pen each of Barred Plymouth Rock and Single-combed Brown Leghorn hens. The object was, first, the acclimatization of a pure-bred strain, and second, the improvement of native stock. One of the bulls died of what was believed to be Texas fever. The remaining animals were hand picked for about 4 months, when it was thought that they had undergone at least partial immunization. Daily temperatures were kept of the cattle for over 6 months, in which periods of abnormally high temperatures were observed in each of the various animals, but the general condition has remained good. The horses, hogs, and chickens are also reported in good condition. The horses are being fed on native roughage. The crossing of the Berkshire on native stock has resulted in an improvement over the ordinary native pig. Troubles due to climatic conditions are being experienced in the use of incubators.

Color inheritance in swine, W. W. SMITH (*Amer. Breeders Mag.*, 4 (1913), No. 2, pp. 113-123, figs. 5).—Experiments in crossing Yorkshire and Berkshire, and Yorkshire and Poland China swine indicated "(1) the complete dominance of the Yorkshire white over the Berkshire or Poland China black in the F_1 or first hybrid generation; (2) a general tendency for the original parent colors to be expressed separately, and in the proportion of 3 dominants to 1 recessive, in the individuals of the F_2 or second hybrid generation."

Hogging down corn.—A successful practice, J. M. EVVARD, W. J. KENNEDY, and H. H. KILDEE (*Iowa Sta. Bul.* 143, pp. 309-354, figs. 5).—This bulletin reports 3 years' experimental work in determining the practicability of allowing hogs to harvest the corn crop, the value of such a system as compared with the dry lot method, and to ascertain the relative importance of different supplemental crops and concentrated feeds when hogs are fed in this way.

Reports received from a large number of farmers to whom inquiries were sent indicate that the hogging down of corn is in common practice and is being found profitable. Experiments testing the value of several supplementary crops when fed in conjunction with hogged-down corn gave the following results with 10 spring shotes per acre:

Returns from hogged-down corn and supplementary crops.

Supplementary crops.	Average daily gain in weight per hog.	Gain of pork accredited per acre.
	Pounds.	Pounds.
Rape and pumpkins.....	0.931	651.7
Soy beans.....	.828	483.8
Canadian field peas.....	.706	333.8
Hairy vetch.....	.418	292.8

The following table shows the comparative returns from supplemented and unsupplemented corn in the field and dry lot, using an average of 11.25 shotes weighing 70 lbs. each per acre:

Comparative returns from supplements in hogging down and dry-lot feeding.

Method of feeding.	Average daily gain in weight per hog.	Cost per 100 lbs. gain, corn at 50 cts..	Net returns per acre, hogs at 6 cts. per pound.	Net value of corn per bushel.	Grain per 100 lbs. live weight daily.
	Pounds.				Pounds.
Hogged down:					
Corn alone.....	0.42	\$5.41	\$2.10	\$0.47	3.37
Corn and 10 per cent meat meal.....	1.23	3.69	18.31	.78	4.79
Corn and soy beans.....	.84	3.87	10.70	.70	3.86
Corn, 10 per cent meat meal, and green rye.....	1.44	3.56	19.27	.87	4.38
Dry lot:					
Corn alone.....	.62	5.43	2.33	.55	4.19
Corn and 10 per cent meat meal.....	1.17	4.35	12.82	.75	4.64

Comparing the average cost of production per 100 lbs. gain with and without the various supplemental crops and feeds, the following results were obtained: Hogged down with soy beans \$2.73, with cowpeas \$2.87, rape and pumpkins \$1.86, Canadian field peas \$4.42, hairy vetch \$5.85, corn without supplement \$3.14, with meat meal \$2.43, and with rye pasture and meat meal \$2.69.

Replies received from a large number of farmers estimate the saving per bushel of corn by the hogging-down method at an average of 6.89 cts. It is the general conclusion that spring farrowed shotes, weighing from 100 to 170 lbs. are the most adaptable to hogging-down conditions, although younger pigs and old sows may be so fed to advantage.

The farmers' reports indicated an average production of 12 lbs. of pork per bushel of corn fed, when hogged down. Actual experiments gave the following results: With standing corn without supplement, 7.76 lbs. per bushel of corn (this is considered low and is accounted for by unfavorable conditions); corn and meat meal 15.73 lbs.; corn, meat meal, and green rye 18.37 lbs.; corn and soy beans 13.05 lbs.; dry lot corn and meat meal 15.30 lbs.; and dry lot corn alone 9.20 lbs. The average size of a field hogged down at one time was reported as 19 acres, carrying approximately 13 hogs per acre. The carrying capacity of an acre of standing corn for a period of 30 days, with shotes weighing from 125 to 150 lbs., is estimated at from 14 to 15 head when corn is yielding 40 bu. per acre, and 21 to 22 head when corn is yielding 60 bu.

The commonly accepted time to turn hogs into the field is when the corn is well dented. The advantages and disadvantages of this method of harvesting the corn crop are discussed, and a method of temporary fencing is described.

Horse breeding and Mendelism, R. MORLOCH (*Deut. Landw. Tierzucht*, 17 (1913), Nos. 32, pp. 377-380; 33, pp. 389-391).—In this article the author discusses the relative influence of environment and of ancestry upon the characteristics of the individual horse, with especial emphasis on the transmission of acquired characters.

The inheritance of coat color in horses, W. S. ANDERSON (*Amer. Nat.*, 47 (1913), No. 562, pp. 615-624).—After extensive studies of the color markings of 11,739 horses, and from the results obtained by previous investigators, the author concludes that with the exception of black and brown, chestnut behaves as a recessive to all other coat colors in horses. Brown is dominant to chestnut and black and recessive to bay. Gray and roan are dominant to bay. An attempt is made to harmonize the theory that brown is recessive to bay with

the actual results obtained in a mating of brown \times brown which resulted in a large percentage of bays. The author believes that the discrepancy here lies in the interpretation of colors.

Horse breaking in Argentina (*Pastoral Rev.*, 23 (1913), No. 9, pp. 886-888, figs. 3).—An account of horse-breaking methods in use in Argentina, and a comparison with those of Australia.

Studies on inheritance in poultry.—I, The constitution of the White Leghorn breed, P. B. HADLEY, DOROTHY W. CALDWELL, and C. H. MAGOON (*Rhode Island Sta. Bul.* 155, pp. 151-216, pls. 3).—By means of suitable matings of white and dark birds a completely barred pattern was secured in F_2 , and a pure strain of barred fowls has been built up from these barred F_2 individuals. This barring characteristic is thought to have its origin in a factor for barring, present in the gametes of the White Leghorn male, and not as was formerly believed in a heterozygous condition of black and white. Evidence indicates that the White Leghorn male is homozygous for this character, while the female is heterozygous; also that the White Leghorn male carries a factor for black pigmentation. However, the presence of an inhibiting factor, which represses the manifestation of black and is homozygous for the White Leghorn male, naturally brings out the barred pattern. The presence of these inhibiting factors is apparently peculiar to the Leghorn breed of fowls as a whole, but may be used to advantage in controlling the manifestation of a variety of characters in poultry. It is believed that this factor for barring, present in the White Leghorn, accounts for various unexplained phenomena often observed in poultry breeding.

A former discussion has been previously referred to (*E. S. R.*, 29, p. 372).

[**Inbreeding**], J. H. ROBINSON (*Farm Poultry*, 24 (1913), No. 10, pp. 214, 215).—This is a discussion of the beneficial or detrimental effects of inbreeding as applied to poultry raising, in which the author practically contends that it is not interbreeding in itself that is harmful but interbreeding without rigid selection or some change of condition.

Report of the poultryman, H. ARWOOD (*West Virginia Sta. Rpt.* 1912, pp. 57-59).—Uncompleted experiments indicate that chicks are less vigorous when hatched from eggs laid by hens which have been laying heavily for a long time. A decided lack of phosphorus in the rations resulted in a material decrease in the number of eggs laid. The composition of the eggs did not seem to be materially changed. It was demonstrated that the average size of eggs laid by hens varies considerably according to the season, the eggs being heavier during February and March than at any other time; also that the eggs from mature fowls are heavier than eggs from pullets.

Report of poultry conditions in Indiana, A. G. PHILIPS (*Indiana Sta. Circ.* 40, pp. 32, figs. 20).—A report of data collected relative to the poultry conditions in Indiana, in which lists of questions were sent out to 2,000 farmers. These questions related to the extent of business, kind and amount of stock, selection or breeding, housing and yarding, feeding, hatching and rearing, diseases and parasites, management, and marketing of poultry.

The refrigeration of dressed poultry in transit, MARY E. PENNINGTON ET AL. (*U. S. Dept. Agr. Bul.* 17, pp. 35, pl. 1, figs. 19).—The purpose of this investigation was to determine the temperatures prevailing in refrigerator cars hauling dressed poultry throughout the entire transportation period, and to observe the effect of such temperatures on the condition of the poultry when it arrives at the market. The experiments reported, covering a period between August, 1909, and October, 1912, include 120 car-lot shipments of dressed poultry and aggregate 140,000 miles of haul. Six different car lines are represented. The

weather conditions varied, depending upon the season and the territory involved. In all of the work commercial surroundings and commercial routine prevailed. Thermographs, or self-registering thermometers, were used to record the car temperatures throughout the entire transit. When the car was opened for unloading, a laboratory examination was made of samples of the fowls, by estimating the amount of ammoniacal nitrogen in the muscle tissue, as an index of the progress of flesh changes, and the amount of free acid in the fat, since the rise in acidity is an indication of the aging of the whole carcass.

Fresh chickens contain about 0.0110 per cent of ammoniacal nitrogen. It was found that poultry shipped under car temperatures of from 18 to 26° F. showed 0.0120 per cent ammoniacal nitrogen; under 27 to 30°, 0.0122 per cent; 31 to 34°, 0.0131 per cent; and 35 to 39°, 0.0141 per cent. This difference in composition at the end of the railroad haul continues with increasing magnitude throughout the period at the wholesale commission house and at the retailer's, while in the commission house the deterioration in the high temperature shipments is always at least one stage ahead of the low temperature shipments. It is evident that even such excellently handled poultry as comprised these experimental shipments, if exposed to unfavorable temperatures during transportation, receive an impetus toward decay that can not be overcome by subsequent irreproachable treatment on the market.

The results indicate that the most favorable temperature for poultry transportation is less than 31° F. The problem of maintaining this temperature is largely a question of car construction. The many different cars used in these shipments furnished a great variety of sizes, insulations, roofs, doors, ice bunkers, and other elements which are factors in the sum total of efficiency. In calculating the relative efficiency of the cars, a formula was devised which would take into account the various factors of icing, surface exposure of the car, atmospheric temperature, inside temperature, length of time in transit, etc. The insulation of the car in relation to temperature appeared to be its most vulnerable and its most important part, the construction of the ice bunker coming next in importance. Certain types of insulation in the side walls and floors of the cars were found to be preferable to others. The cars with the best insulated and best built roofs proved to be the most efficient. Moist floors were found to be a serious defect in the present construction of cars.

The wire basket type of bunker is thought to be the most efficient, since an abundant air access to ice and salt results in increased efficiency. Likewise the holding back of the brine in the tank bunker increases the ability of the bunker to chill the car and hence results in increased efficiency. These and other points in construction are regarded as the essential features of the most efficient refrigerator car of the future.

DAIRY FARMING—DAIRYING.

A comparison of first, second, and third crop alfalfa hay for milk production, W. E. CARROLL (*Utah Sta. Bul. 126, pp. 153-189*).—In view of the popular disfavor toward second crop alfalfa as a feed for dairy cattle, experiments were conducted during 2 seasons, 1911-12, and 1912-13, with first, second, and third crops of alfalfa to determine the relative value of these crops. In these experiments the alfalfa was fed ad libitum, with a grain mixture of 0.65 lb. daily to each cow per pound of milk fat produced per week. The test periods were from 3 to 4 weeks' duration, and the feed unit system was adopted.

A summary of the feed units consumed and the milk fat produced with the various crops is shown in the following table:

Feed consumption and milk fat production on first, second, and third crop alfalfa hays.

Crop.	Feed units consumed.	Milk fat produced.	Milk fat for 100 feed units consumed.
		Pounds.	Pounds.
First.....	14,055	784	5.00
Second.....	12,835	687	5.36
Third.....	14,120	671	4.78

While these experiments indicate that second crop alfalfa is at least equal in economy to the other crops, it is noted that it is less relished and that other practical difficulties may tend to reduce its actual value.

Manuring for milk, F. WAKERLEY (*Midland Agr. and Dairy Col. Bul. 1, 1912-13, pp. 8, pl. 1*).—A comparison of the feeding values of 2 pastures of 4 acres each, and treated with 10 cwt. ground lime per acre, one being also fertilized with 4 cwt. superphosphate and $1\frac{1}{2}$ cwt. sulphate of potash per acre. The total yield of milk during the 3 seasons, 1910-1912, was 8,740 lbs. on the unmanured and 13,661 lbs. on the manured pasture.

Winter feeding of dairy cows, J. MACKINTOSH (*Jour. Southeast. Agr. Col. Wye, 1912, No. 21, pp. 57-82*).—In this article the author attempts to outline a rational system of dairy cattle feeding, in which he discusses the Kellner, Armsby, Hansson, and Haecker standards of feeding and suggests a number of successful dairy rations involving home-grown feeds.

The original St. Lambert Jerseys.—An account of their breeding. C. CLARK (*Kimball's Dairy Farmer, 11 (1913), No. 18, pp. 542-545, figs. 10*).—The author reviews the foundation, development, and capabilities of the St. Lambert strain of Jersey cattle, and compares this American-bred type with the finer boned Jersey Island-bred type.

Comparative experiment between Red Danish milch cattle, Jersey cattle, and Dano-Jersey cattle. J. J. DUNNE (*Hoard's Dairyman, 46 (1913), No. 9, pp. 234, 235*).—Comparing these 3 groups, consisting of 15 cows each of approximately the same age, during a period of 2 seasons as regards their average yields and cost of production, the results as summarized in the following table were obtained:

Average yearly yield and cost of production per cow.

Kind of cows.	Yield of milk.	Yield of milk fat.	Yield of butter.	Feed units consumed.	Cost of a home-grown feed unit.
	Pounds.	Per cent.	Pounds.		Cents.
Red Danish.....	8,183	3.53	321.6	6,114	1.63
Jersey.....	4,343	5.69	279.6	4,799	1.66
Dano-Jersey.....	6,327	4.32	306.8	5,375	1.72

In churning and buttermaking experiments the Jersey butter was firmer and harder than the Red Danish, due to a lower olein content, but the feeding of rape oil reduced this hard and brittle consistency.

Milking capacities of the Trinidad government farm cows, H. S. SHREWSBURY (*West Indian Bul.*, 13 (1913), No. 3, pp. 281-287).—Half-bred zebus produced an average daily milk yield of 5.6 qt., testing 3.37 per cent fat, and are reported as good dairy animals for that locality.

Dairying in Jamaica, H. H. COUSINS (*Bul. Dept. Agr. Jamaica, n. ser.*, 2 (1913), No. 7, pp. 253-296, pls. 10).—A general treatise on dairying conditions in Jamaica, in which the author outlines methods of improvement of the native stock. It is noted that importations of pure-bred stock are being made from North America. The Guernsey is given preference as a foundation stock for the purely dairy animal, while the Red Poll has proved valuable as a dual purpose breed. Analyses of the milk of various breeds and crossbreeds are given.

Ninth biennial report of the state dairy bureau [for the biennial period ending November 30, 1912] (*Bienn. Rpt. State Dairy Bur. Cal.*, 9 (1911-12), pp. 49, figs. 9).—A general report of dairying opportunities in California, with statistics on the milk, butter, and cheese output, and a list of creameries in operation in the State.

Quarterly report of the dairy and food commissioner of Virginia, W. D. SAUNDERS (*Quart. Rpt. Dairy and Food Comr. Va.*, 1913, Mar.-May, pp. 43-46, 50-55, 62-68).—This report includes an inspection of 114 dairies and dairy farms and of a number of creameries, collecting stations, and cheese factories, also the examination of misbranded, adulterated, and otherwise illegal stock feeds.

Michigan's new milk and cream law, R. G. KIRBY (*Mich. Farmer*, 141 (1913), No. 8, p. 1, figs. 2).—An account of the new Michigan milk and cream law looking toward sanitation in the dairy and increased purity of the milk.

Milk and cream testing, H. H. DEAN (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm*, 38 (1912), pp. 70-83).—This continues work previously reported (*E. S. R.*, 27, p. 777).

In comparison of the results obtained from the sampling of cream for composite samples by the aliquot and ounce methods, it was found that on a delivery of over 1,400 lbs. fat the total difference by the 2 methods was 8.9 lbs. in favor of the ounce method. Open bottle samples of cream gave "results altogether too high and show very forcibly the need of keeping composite bottles tightly stoppered." Composite samples kept in cold storage proved to be in better condition at the end of one month than were those kept at room temperature. Contrary to expectation, samples kept in cold storage frequently tested "a higher percentage of fat than did those kept at room temperature," this being probably due to the more accurate sampling possible with this better cream. Comparing daily, weekly, semi-monthly, and monthly tests for accuracy of results, it is concluded that the last 3 methods "will credit patrons with approximately correct weights of fat delivered, as compared with testing each and every delivery of cream to the creamery." Tests of 3 different cream scales indicated that a sample of cream may be tested within about 0.2 per cent of accuracy on a 12-bottle cream scale, irrespective of the number of the bottles weighed at one time.

Tests with formalin as a preservative in composite milk and cream samples "show that about one-half a cubic centimeter of formalin will preserve a pint sample of milk or cream in good condition for testing for a month. When 1 cc. of formalin was used the tests were not satisfactory unless an extra volume of sulphuric acid was used (20 and 21 cc. instead of 17.5 cc.)."

It was found that the greatest differences in the cream transported in an ordinary can and a jacketed can was 6° F. in temperature and 0.05 per cent acidity in favor of the cream in a jacketed can. The average difference was 3.6° in temperature and 0.022 per cent acidity. As a rule, there was not sufficient

decrease in the acidity of the cream in the jacketed can to pay for the extra expense and inconvenience.

Tests for 2 years indicate that the average cost of pasteurizing cream for the manufacture of 100 lbs. of butter is 3.3 cts. A combined pasteurizer and cream vat, it is said, gave satisfactory results in reducing the cost of labor in heating and cooling milk and cream. Results from stirring milk while cooling *v.* not stirring indicated that "there was little or no difference in the temperature of the milk in the cans not stirred, comparing milk in the center of the can with that near the outside, or 6 in. from the outside. The milk cooled more rapidly when stirred, and had slightly less acid the following morning, but there was very little difference in the general condition of the 2 lots. Under ordinary conditions in the case of milk for cheese making it would seem as if stirring were not necessary, except where more rapid cooling is desired."

Butter making, H. H. DEAN (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm*, 38 (1912), pp. 83-91).—Continuing work previously noted (*Id. S. R.*, 27, p. 779), the effect of neutralizers of acidity in cream for butter making was studied, with the result that "butter scored about 3 points higher by adding milk lime to the cream before pasteurizing, and $3\frac{1}{2}$ points higher by adding the milk lime after pasteurization, as compared with the scores of butter from similar lots of cream which were not neutralized." The use of a small quantity of concentrated milk lime proved preferable to a larger quantity of limewater. It is suggested that the prevention of the development of acidity by keeping the cream cold and more frequent delivery would prove preferable to the use of a large quantity of "neutralizer."

Comparing the results obtained from the use of raw *v.* pasteurized cream for butter making, it is concluded that "there was a greater loss of fat in the buttermilk from the lots pasteurized. The 'overrun' or yield of butter was less from the lots of cream pasteurized. There was not much difference in the quality of the butter as indicated by the scores. This is different from the results got in previous experiments, and is accounted for by the relatively high scores given to the raw lots when fresh."

With a view to determining to what extent the acidity of the cream pasteurized affected the percentage of fat lost in the buttermilk, a series of experiments was conducted and showed an increased loss of fat in the buttermilk as a consequence of increased acidity of the cream at the time of pasteurization. It is explained that this is probably due to an "increased coagulation of the caseous matter which entangles more of the fat globules and prevents their churning or massing in the form of butter." It is stated that "the cream pasteurized with the higher acidity produced butter which gave a lower average score as compared with butter made from similar cream pasteurized on arrival at the creamery when moderately sweet."

Continuing previous tests on the conditions affecting the salt and moisture in butter, it was found that salt added to butter in a wet condition was "better distributed and more in solution than were the dry salt lots." The average percentage of moisture retained in the finished butter was practically the same with both saltings. Tests on the retention of salt in the butter by the 2 methods do not agree. "Butter churned to about the size of wheat granules contained more moisture and less salt than did similar butters churned to lump size." Grittiness in butter is ascribed to an overabundance of salt. It was found that a saturated salt solution contained, on an average, 29.25 per cent salt, and a table is given showing the percentage of salt that butter with a moisture content ranging from 13.5 to 16 per cent is capable of holding in solution. Quantities of salt ranging from 4.29 to 5.77 lbs. per 100 lbs. butter

were added to churnings, with a resulting retention of salt of from 3.156 to 3.45 lbs., the loss being accounted for in the churn water and on the worker. A loss of moisture and salt in butter was found in the process of printing and packing, and after 1, 2, and 3 months in cold storage there was a steady decrease in moisture content, the salt content remaining fairly uniform.

Some butter-making experiments and analyses, R. CROWE (*Jour. Dept. Agr. Victoria*, 11 (1913), No. 6, pp. 357-366, figs. 4).—In testing the supposed value of salt as a butter preservative it was found that after a period of 5 weeks' storage unsalted butter scored higher than did salted. The author believes that the presence of salt facilitates bacterial development in butter. Analyses of 19,470 samples of Victorian butter showed an average composition of 83.5 per cent fat, 13.84 per cent moisture, 0.76 per cent curd, 1.82 per cent salt, and 0.2 per cent boric acid.

Cheddar cheese investigations and experiments, H. H. DEAN (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm*, 38 (1912), pp. 56-70).—Continuing work previously reported (*E. S. R.*, 27, p. 777), analyses of the milk delivered at Ontario cheeseries during 1912 showed an average casein content of 2.14 per cent, the highest percentage being 2.58, the lowest 1.79; and an average fat content of 3.52 per cent, the highest 4.53, the lowest 2.79 per cent.

Comparing the results of 2 years, 1911 and 1912, one a wet the other a dry season, no apparent effect of season upon the casein and fat content of milk was noted. "The averages for milk fat and casein for the season of 1911 were 3.77 and 2.37; for 1912, 3.61 and 2.18, respectively. . . . These results do not coincide with the theory that a dry, hot season tends to produce milk with low fat and casein contents and a wet season the reverse. As in previous years, the milk during the months of September and October tends to be relatively higher in fat and casein content, due doubtless to advancing lactation among cows, consequently less milk is required to make a pound of cheese than is the case earlier in the season."

In vat tests, the average number of pounds of milk required to make a pound of cheese was 10.79, which is practically the same as for 1911. The lowest amount required was 9.68 lbs. in October, the highest 11.43 lbs. in August. The average number pounds of cheese per pound of fat in milk for the different months proved to be fairly uniform, ranging between 2.43 lbs. for August and 2.58 lbs. for July and October; and per pound of casein 3.9 lbs. in August and 4.15 lbs. in July.

Comparing cheese made from 2 separate vats, one containing milk of low fat and casein content (3.42 and 2.09 per cent), and the other high fat and casein content (3.84 and 2.36 per cent), the following results were obtained:

Production of cheese from milks of high and low fat and casein content.

Kind of milk.	Cheese per pound of fat in milk.	Cheese per pound of casein in milk.	Fat content of cheese.	Average shrinkage.	Cheese per 1,000 pounds milk.	Milk required per pound of cheese.
	<i>Pounds.</i>	<i>Pounds.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Pounds.</i>	<i>Pounds.</i>
Low fat and casein.....	2.64	4.33	35.45	2.803	90.70	11.02
High fat and casein.....	2.50	4.02	36.49	2.801	96.23	10.39

The average percentage of moisture in the cheese was the same for both lots, 3.45.

Comparing cheese made from normal and from overripe milk, it is concluded that "the overripe milk of similar composition to that in normal condition pro-

duced 2.2 lbs. less cheese per 1,000 lbs. of milk. The 2 previous years the differences were 2.4 and 2.5 lbs. less per 1,000 lbs. milk from the overripe lots. Both lots contained practically the same percentages of moisture in both green and ripe cheese. The quality of the cheese was inferior in all cases made from the overripe milks. To increase the yield of cheese and improve the quality it is important that patrons of cheeseries shall cool the milk on the farm so as to have it arrive at the factory in a sweet condition."

No difference was noted as to the effect of acid at time of adding rennet to milk. "An average increase of 0.027 per cent acid in the whey at the time of dipping, or removal of the curd from the whey, reduced the yield of cheese per 100 lbs. of milk by 0.4 lb. Last year the reduction was 0.42 lb., and the previous year it was 0.73 lb. All 3 years' results emphasize the importance of separating curd and whey when comparatively sweet in order to have a 'good average', or lessen the weight of milk required to make 1 lb. of cheese. The lots dipped with high acid had greater loss of fat in the whey, greater shrinkage, less moisture in curd and cheese, and scored an average of nearly one point less."

In determining the effect of varying weights of salt applied to curds (2½, 2¼, 2⅓ lbs. salt per 1,000 lbs. milk), it was noted that increasing the salt reduced the loss by shrinkage during the ripening. There was a slight decrease in moisture content of the cheese, both green and ripe, as the salt was increased, and the highly salted cheese averaged slightly higher in the scoring.

"Cheese ripened in cold storage retained more of the original moisture in the cheese at the end of one month than did cheese ripened in the ordinary ripening room. Most of the loss of moisture in both lots took place from the first inch of the cheese, which included the rind. The greatest loss was during the first week of ripening. The results of 2 seasons' work agree in showing that the loss of moisture from a cheese during ripening takes place nearly altogether from the surface, and that the moisture in the center of the cheese remains fairly constant for at least a month."

There was less shrinkage in ripening cheese in a room of 40° F., than in one of 60° or 70°. The average percentage of moisture was approximately the same. The quality of the cheese was superior in the lots ripened at the lower temperature.

In a comparison of pasteurized *v.* raw milk or cream, it was concluded that "the yield of cheese was slightly greater by adopting pasteurization for Camembert and cream cheese," there being no difference in the case of Gervais cheese. The moisture content was variable and the results were inconclusive. The quality of cheese was superior in the case of the pasteurized milk or cream.

Caerphilly cheese, MISS G. N. DAVIES (*Jour. Agr. [New Zeal.]*, 7 (1913), No. 1, pp. 40-44, figs. 3).—Directions are given for renneting, cutting, scalding, pitching, vatting, salting, pressing, curing, and other processes in the manufacture of Caerphilly cheese.

VETERINARY MEDICINE.

Protective ferments of the animal organism, E. ABDERHALDEN (*Schutzfermente des tierischen Organismus*. Berlin, 1912, pp. XII+110, figs. 8).—This is a contribution in regard to the methods whereby the animal body protects itself against detrimental body and blood substances and substances foreign to the cells. The subject is treated under the following headings: Enzymes of the cells; formation of protective enzymes, including protein substances foreign to the body and the blood with particular reference to anaphylaxis, foreign carbohydrates, fats, nucleoproteids, and nucleins; the origin of protective ferments;

the detection of native body substances foreign to the blood; biological diagnosis of pregnancy; the optical method and its use in pathology; the significance of milk for the suckling; the use of the optical method in the field of infectious diseases; etc. A large bibliography is appended.

Investigations in regard to streptolysin, O. VON HELLENS (*Centbl. Bakt. [etc.]*, 1. Abt., *Orig.*, 68 (1913), No. 7, pp. 602-644, figs. 12).—The results of this extensive investigation show that streptolysin formation takes place very rapidly and can be noted 1 hour after inoculation. A maximum formation can take place within 7 to 8 hours. The greatest amount of hemolysin formation, which depends upon the nutrient medium and the strain of bacteria employed, is said to be between the seventh and eighteenth hour. As soon as it reaches its fastigium it begins to decrease, and in the first 24 hours this decrease is very rapid. In the greatest number of cases no hemolysin was noted after 8 to 13 days. In anaerobic cultures streptolysin formation and depreciation take place in almost the same manner as in aerobic cultures. In the latter cases, however, they were produced a little more slowly, and a lower amount was formed.

The best nutrient medium for the streptococcus was a horse serum-bouillon containing from 40 to 50 per cent of a serum inactivated at 56° C. for one-half hour. Rabbit serum (10 per cent) bouillon was inferior to ascitic fluid (33 per cent) bouillon. Only a slight development of streptolysin took place in a plain alkaline peptone bouillon, but when 5 per cent of peptone was added to cultures in other media there was a marked increase, in one case over 300 per cent. Evidently a prolysin (Walbum) is present in such cultures which is destroyed when the bacteria are continuously cultivated in the thermostat. The hemolysin present in serum- and ascitic fluid-bouillon cultures is filterable. The filtrate from horse serum bouillon cultures is from 1.1 to 1.4 times weaker than the cultures themselves.

In human, horse, bovine, sheep, goat, dog, pig, rabbit, guinea pig, and pigeon blood appreciable quantities of antistreptolysin could not be noted. The hemolytic action of streptolysin showed a different intensity at different temperatures, being from 4 to 6 times more active at 37° C. than at room temperature, while at nearly freezing temperature it is practically inactive. The greatest resistance toward hemolysin was noted with the blood of the goat and sheep, that of man, horses, bovines, and pigeons coming next, and this being followed by rabbit, dog, pig, and guinea pig blood. A decoloration of the blood of the horse, bovine, sheep, and goat took place as a result of hemolysis. The blood corpuscles of man, the pig, and the guinea pig were agglutinated in some cases.

The hemolytic principle of streptolysin was soluble in ether, and almost the entire quantity present in the culture could be extracted with this solvent. The streptolysin present in the filtrate was labile and was inactivated rapidly by cooling to -16°, at +4 to 5°, at room temperature, or by heating at 37° or above. Horse serum bouillon streptolysin was the most resistant. The streptolysin extracted from the filtrates was thermostable. The addition of hydrochloric acid seemed to increase the inactivation of streptolysin by heat. The rate of preventing inactivation by sodium hydroxid seemed to bear some relation to the hydrogen ion concentration of the solution.

The laws and rules and regulations governing live stock sanitary control work in Tennessee, 1913-14 (*Nashville: Tenn. Dept. Agr.*, 1913, pp. 47, fig. 1).—A compilation of the various laws, rules, and regulations relating to live stock sanitary control work in Tennessee.

The results of meat inspection in Brunswick, 1905-1911, C. SANDER (*Beitr. Statist. Braunschweig*, 1913, No. 26, pp. 23-47).—A statistical report of inspection work.

Conditions influencing the transmission of East Coast fever. G. H. F. NUTTALL and E. HINDLE (*Parasitology*, 6 (1913), No. 3, pp. 321-332).—Experiments in the transmission of East Coast fever here reported led the authors to conclude that "infected ticks do not produce infection during the first 2 days when feeding on cattle. Infected ticks are still infective after feeding upon a rabbit for 3 days. Heating infected ticks to 37° C. for 3 days does not render them infective during the first 2 days after they become attached to the host. The partial feeding of infected ticks for 2 days, followed by starvation for 17 days, renders them noninfective. Inoculations of emulsions of infective ticks collected from cattle on the fifth day of engorgement failed to produce infection. Infective ticks are rendered noninfective by exposure to a temperature of about 10° for 3 weeks. Their infectivity may be restored by subsequently warming them."

Piroplasmosis, G. H. F. NUTTALL (*Parasitology*, 6 (1913), No. 3, pp. 302-320, figs. 14; *Bul. Johns Hopkins Hosp.*, 24 (1913), No. 272, pp. 307-316, figs. 22).—This is a summarized account of the present knowledge of piroplasmosis.

Experimental investigations on the therapeutic action of yeast in alimentary, multiple polyneuritis in guinea pigs and pigeons, M. BARSICKOW (*Biochem. Ztschr.*, 48 (1913), No. 5, pp. 418-424, pl. 1).—Dried living yeast cells, zymín (acetone permanent yeast), Cerolin (an alcoholic extract of the fatty substances present in yeast), and a yeast killed by drying at 120° C. were used in these experiments. No difference was noted in the therapeutic effects between those preparations containing enzymes or living yeast cells and dead yeast cells which contain no enzymes. It is concluded that in all probability the therapeutic properties of yeast depend upon the nuclein or salts of nucleic acid which it contains.

Cultivation of the rabies organism, ANNA W. WILLIAMS (*Jour. Amer. Med. Assoc.*, 61 (1913), No. 17, pp. 1509-1511, figs. 2).—The author reports observations made during the course of studies of Negri bodies, in which attempts were made to cultivate the virus.

The parasite of rabies, O. BARTHOLOW (*Jour. Amer. Med. Assoc.*, 61 (1913), No. 17, pp. 1555, 1556).—A critical review of recent literature.

Note on rinderpest, E. W. OLIVER (*Dept. Land Rec. and Agr. United Prov. Agra and Oudh, Agr. Ser.*, 1913, *Bul.* 28, pp. 13, pl. 1, figs. 11).—A general description of this disease, including vernacular names for rinderpest as used in various parts of India, diagnosis, and treatment, based upon observations in India and South Africa.

The morphology of *Trypanosoma simiæ* n. sp., D. BRUCE ET AL. (*Proc. Roy. Soc. [London]*, Ser. B, 85 (1912), No. B 581, pp. 477-481, pl. 1, figs. 3).—" *T. simiæ* n. sp. is a well-defined species, easily separated by its morphology alone from the other trypanosomes which have been described as causing disease among domestic animals. It sets up a chronic disease in goats, but is chiefly remarkable for its rapidly fatal action on monkeys. In Nyasaland it is carried by *Glossina morsitans* and in this district, Central Angoniland, this tsetse fly is found to be heavily infected with this trypanosome."

Trypanosomes of the domestic animals in Nyasaland.—I. *Trypanosoma simiæ* n. sp., II, III, D. BRUCE ET AL. (*Proc. Roy. Soc. [London]*, Ser. B, 87 (1913), No. B 592, pp. 48-57, 58-66, pls. 3).—Continuing the studies noted above, the authors find that as regards the susceptibility of various animals, *T. simiæ* belongs to the same group as *T. pectorum*, and like the latter is erratic in its action. It affects goats, sheep, pigs, and monkeys, while oxen, antelope, dogs, rabbits, guinea pigs, and rats are practically immune. The reservoir of the virus is the warthog.

T. simia multiplies in the intestines and in the labial cavity of the proboscis of *Glossina morsitans*. Here only developmental forms are found, never infective forms. The *T. simia* growing in the intestines of the 'fly' has no specific characters by which it can be distinguished from other species of pathogenic trypanosomes found in tsetse flies. The final stage of the development takes place in the hypopharynx, wherein the infective form of the parasite, similar in shape to the trypanosome found in the blood of infected animals, is produced. The flies do not become infective until about 20 days after their first infected feed.

Trypanosome diseases of domestic animals in Nyasaland.—II, *Trypanosoma capræ*, D. BRUCE ET AL. (*Proc. Roy. Soc. [London], Ser. B*, 86 (1913), No. B 587, pp. 278-284, pl. 1, fig. 1).—" *T. capræ* belongs to the same group as *T. vivax* and *T. uniforme*, and affects the same animals, cattle, goats, and sheep. Monkeys, dogs, and the smaller laboratory animals are immune. The carrier is *Glossina morsitans*. The reservoir of the virus is the wild game living in the 'fly country.'"

The trypanosomes found in the blood of wild animals living in the sleeping sickness area, Nyasaland, D. BRUCE ET AL. (*Proc. Roy. Soc. [London], Ser. B*, 86 (1913), No. B 587, pp. 269-277).—"Thirty-one and seven-tenths per cent of the wild game in the 'fly country' below Kasu Hill harbor pathogenic trypanosomes. The species of trypanosomes found are *Trypanosoma brucei* vel *rhodesiense* 7.8 per cent, *T. pectorum* 14.4, *T. simia* 1.7, *T. capræ* 11.1, and *T. ingens* 1.7. It is self-evident that these wild animals should not be allowed to live in 'fly country,' where they constitute a standing danger to the native inhabitants and the domestic animals. . . . Active measures should be taken for their early and complete blotting out. . . .

"No pathogenic trypanosomes have up to the present been found by the commission in the blood of animals living in fly-free areas."

Morphology of various strains of the trypanosome causing disease in man in Nyasaland, D. BRUCE ET AL. (*Proc. Roy. Soc. [London], Ser. B*, 86 (1913), Nos. B 589, pp. 394-407, figs. 7; pp. 408-421, figs. 7; B 592, pp. 26-35, pls. 3, figs. 2).—The authors conclude that the 5 wild game strains resemble each other closely, and all belong to the same species of trypanosome (*Trypanosoma rhodesiense* (Stephens and Fantham).) The human strain differs to some extent, but also belongs to the same species. "There is some reason for the belief that *T. rhodesiense* and *T. brucei* (Plimmer and Bradford) are one and the same species."

"The trypanosome of the Mzimba strain is the same species as that occurring in the wild game inhabiting the Proclaimed Area, Nyasaland. It has already been concluded that this species is *Trypanosoma brucei* vel *rhodesiense*. Hence it would appear that wild *Glossina morsitans* occurring in a district 100 miles north of the Proclaimed Area are infected with the trypanosome which causes the human trypanosome disease of Nyasaland."

Studies on the biochemistry and chemotherapy of tuberculosis, IV, V, VI (*Jour. Infect. Diseases*, 12 (1913), Nos. 1, pp. 68-92; 2, pp. 249-275).—These parts continue previous work (E. S. R., 29, p. 177).

IV. Preliminary report of experiments in the vital staining of tubercles, Lydia M. DeWitt (pp. 68-92).—"Among the dyes so far tested, trypan blue, trypan red, isamin blue, pyrrhol blue, Ehrlich's rectified methylene blue, medicinal pure methylene blue, methylene blue of the U. S. Pharmacopœia, new methylene blue N, new methylene blue GG, and to some extent neutral red and pyronin have been found to penetrate tubercles in guinea pigs. Basic fuchsin, crystal violet, and the other new methylene blues are now being tested. . . .

"The dyes above mentioned are well borne for a long period if the dose of the methylene blues, basic fuchsin, and crystal violet is not too large. Almost any dose of the first 4 dyes mentioned is well borne. The individual bacillus itself is penetrated and well stained by all the methylene blues, by basic fuchsin, and crystal violet, by erythrosin and the eosins; not so well by trypan blue, trypan red, isamin blue, pyrrhol blue, pyronin, and neutral red. Methylene blue, Bismarck brown, and brilliant cresyl blue are the only dyes which have a possible bactericidal power over the organism, though many of the others seem to inhibit its growth in the test tube."

These experiments confirm von Linden's findings in so far that they demonstrate the possibilities of staining the tubercle bacillus in vitro, and also show that the dyes penetrate the tubercles in vivo. No stained tubercle bacilli were ever found in the tubercles or in tuberculous pus stained with dye.

V. *The behavior of the tubercle bacillus toward fat dyes*, Hope Sherman (pp. 249-273).—"All the dyes used, whether fat-soluble or not, stain pure cultures of tubercle bacillus, en masse, because of the presence of stainable substances outside the bacilli. Sudan III does not stain individual tubercle bacilli, either in smears of pure culture, in tuberculous pus, or in tuberculous tissue. Sudan yellow and Sudan brown stain the bacilli faintly, in pure culture smears, upon prolonged exposure, or on heating. Scarlet red resembles Sudan III in behavior, but is slightly less inefficient, about half the tests for individual staining being doubtful or even faintly positive.

"Nile blue sulphate gives a faint and rather unsatisfactory bacillus stain, as does Janus green, for the most part. A single smear stained with Janus green showed deeply stained bacilli, but this could not be duplicated. Indulin stains the bacilli faintly upon prolonged application. Indophenol blue does not show any bacillus stain. Dimethylaminoazobenzol gives a faint and unsatisfactory bacillus stain. Basic fuchsin, which is only slightly fat-soluble, eosin, and methylene blue, which are not fat-soluble, stain the individual bacilli deeply in a relatively short time.

"All the dyes used stained the impure ether extract of tubercle bacilli, while the purified ether extract was less readily stained by the majority of the dyes not classed as 'fat dyes.' The behavior of the dyes toward the impure ether extract corresponds with their behavior toward cultures of the bacilli, and is very different from that toward the individual bacilli. These facts seem to indicate that masses of ether-soluble substance exist on the surface of cultures as well as within the bacterial protoplasm, and it is with this extracellular material that the dyes combine. Basic fuchsin and eosin, and to a less extent Bismarck brown resemble the regular fat dyes in the ease with which they stain the ether extract. Dilute solutions of Nile blue sulphate and neutral red are more efficient than the saturated, in the staining of the ether extract. The fat dyes are not serviceable for the detection of tubercle bacilli in pus or in tissue, nor for their staining in pure cultures.

"Experiments with crushed bacilli confirm Benians' view that the acid-fastness of the tubercle bacillus depends upon the physical integrity of the bacterial cell. The fatty constituents of the tubercle bacillus are not, per se, the cause of the staining reaction characteristic of this organism."

VI. *Intra-vitam staining of tuberculous guinea pigs with fat-soluble dyes (supplementary note)*, H. J. Corper (pp. 274, 275).—"If indulin, dimethylaminoazobenzol (1 per cent in oil), and Bismarck brown (1 per cent in oil and water) are fed to tuberculous guinea pigs, they do not appear to enter the organs nor tuberculous areas to any appreciable extent when given for a period of about 65 days. Alkanin and annato, 1 per cent in oil, do not enter within a period of 14 days.

Contribution to the study of pulmonary tuberculosis induced experimentally by inhalation, V. GRYZE and D. PETIT-DUTAILLIS (*Compt. Rend. Soc. Biol. [Paris]*, 73 (1912), No. 37, pp. 728-730; abs. in *Ztschr. Immunitätsf. u. Expt. Ther.*, 11, Ref., 6 (1912), No. 12, pp. 927, 928).—In the experiments 78 guinea pigs were exposed in a specially constructed lead chamber to a spray of an emulsion of bovine tubercle bacilli. Twenty of the animals received one inhalation, and of these 19 died within 17 to 133 days. All showed well-disseminated, cheesy foci, and 3 cavern formations. A second group of animals received 2, 3, 4, 5, 6, 7, and 8 inhalations in from 2 to 36 hours. The guinea pigs which received 4 and 5 inhalations per day showed only slight sclerotic lesions, and almost one-half of the animals were free from tubercular changes.

In a third group where numerous inhalations were given at intervals of from 8 to 30 days, appreciable evidences of tuberculosis were present in all animals. Some of the animals died, others were killed.

New researches upon inhalation tuberculosis, P. CHAUSSÉ (*Bul. Soc. Cent. Méd. Vét.*, 89 (1912), No. 16, pp. 361-363).—This is a summary of a thesis submitted in competition for the Trasbot prize of 1912. See also previous notes (E. S. R., 26, pp. 179, 783).

Experimental pulmonary tuberculosis in the dog, P. A. LEWIS and C. M. MONTGOMERY (*Jour. Expt. Med.*, 17 (1913), No. 5, pp. 527-534, pl. 1).—Large quantities of tubercle bacilli of the bovine type introduced directly into the lungs by way of the air passages failed to reproduce a chronic pulmonary tuberculosis in the dog.

Milk-borne tuberculosis with special reference to impending preventive legislation, S. DELÉPINE (*Jour. State Med.*, 21 (1913), No. 6, pp. 336-363, figs. 2).—This is an extended article dealing with the improvement in the mortality from tuberculosis which has been effected in Manchester, England, by methods of inspection and inoculation. Results obtained in the course of 15 years are summarized as follows: "The proportion of tuberculous milk (as supplied to consumers) has been reduced to nearly one-third of the original amount. The number of farms with cows suffering from tuberculous mastitis has been reduced to nearly the same extent. The infectivity of the milk which still remains tuberculous has been reduced to a much greater extent. The proportion of cases of tuberculosis in children under 5 years of age has been reduced by one-half."

The author discusses pending legislation looking toward tuberculosis control and eradication.

Combating bovine tuberculosis with especial reference to the clinical and bacteriological diagnosis of the disease, R. VON OSTERTAG (*Die Bekämpfung der Tuberkulose des Rindes mit besonderer Berücksichtigung der klinischen und bakteriologischen Feststellung*. Berlin, 1913, pp. XII+591, figs. 88; rev. in *Berlin. Tierärztl. Wehnschr.*, 29 (1913), No. 17, p. 308).—The successive sections of this work take up the occurrence and distribution of the disease, the significance which it has from an economic and sanitary standpoint, and the necessity for combating the disease in bovines; investigations which have been conducted and the possibility of eradicating the disease; the significance of the various kinds of tuberculosis, i. e., open forms and nonoccult cases, for the distribution of the disease; clinical and bacteriological methods for diagnosing tuberculosis (with 88 illustrations); laws in regard to the control and eradication of tuberculosis in bovines; and various kinds of blanks which are used in the control of tuberculosis, official work in regard to tuberculosis, tariffs, etc.

The introduction and spread of the cattle tick (*Boophilus annulatus* var. *microplus*), and of the associated disease tick fever (babesiasis) in Austra-

lia, J. A. GILRUTH (*Proc. Roy. Soc. Victoria, n. ser., 25 (1912), No. 1, pp. 15-22*).—A historical account.

The hypodermic affection of cattle.—The ox warble, COPPENS (*Ann. Méd. Vét., 62 (1913), Nos. 6, pp. 309-328; 7, pp. 384-388*).—The first part of this paper relates to losses caused by this pest through its injury to the hide, flesh, etc.; the second part to its biology; and the third part to methods of control.

Bush sickness investigations, C. J. REAKES and B. C. ASTON (*Jour. Agr. [New Zeal.], 6 (1913), Nos. 4, pp. 399-401, fig. 1; 6, pp. 616-624, figs. 2*).—These reports relate to experiments in which various top dressings were applied to the soil and cattle and sheep then grazed upon the treated pastures. The best results were obtained in the case of cattle with soil dressings of (1) superphosphate, (2) sulphate of iron, (3) blood and bones, and (4) guano; in the case of sheep, with (1) sulphate of iron, (2) basic slag, and (3) superphosphate.

Vaccination against gangrenous mammitis in sheep and goats, J. BRIDRÉ (*Bul. Soc. Cent. Méd. Vét., 90 (1913), No. 8, pp. 184-187*).—This condition, with the vaccine originally used against it, has been previously discussed (E. S. R., 19, p. 1185). The work has now been continued for the purpose of obtaining a vaccine which will produce the smallest amount of lesions post-injection. Some tests with sheep are included, from which the conclusion is drawn that it is possible to obtain immunity against this condition by the treatment recommended.

Directions for using antihog cholera serum, J. F. MITCHELL (*California Sta. Circ. 106, pp. 3-14, figs. 6*).—A detailed account of the manner of immunizing hogs against hog cholera.

Virulent anthrax bacilli in the saliva of an affected horse, J. G. T. ARNTZ (*Berlin. Tierarztl. Wchnschr., 29 (1913), No. 36, p. 640; abs. in Vet. Rec., 26 (1913), No. 1317, p. 217*).—The author records the finding of virulent anthrax bacilli in the saliva of an affected horse showing considerable swelling of the throat. He thinks that transmission of the disease is possible by direct contact through the saliva.

The bacteriology and vaccine therapy of distemper in horses, W. LINTZ (*Jour. Expt. Med., 17 (1913), No. 5, pp. 511-516*).—Negative results were obtained in the attempt to immunize sick animals passively through the injection of serum from horses which had recovered from the disease. A vaccine consisting of 800,000,000 each of the pneumococcus and of the bacillus isolated, injected subcutaneously in the region of the neck, had a curative effect. An immunity conferred by vaccination with 50,000,000 of each organism apparently does not last longer than one year, though it lasts much longer if 3 inoculations are given at intervals of 3 days. By vaccinating affected as well as unaffected horses the following year the epidemic was promptly eradicated, not a single case proving fatal.

The diagnosis of dourine by complement fixation, J. R. MOHLER, A. EICH-HORN, and J. M. BUCK (*U. S. Dept. Agr., Jour. Agr. Research, 1 (1913), No. 2, pp. 99-107*).—Dourine, which is caused by *Trypanosoma equiperdum*, was first seen in the United States in 1886 and was noted at later periods in Nebraska, South Dakota, and Iowa, and in Montana in 1912. The disease when present in a chronic or latent form is difficult to diagnose, and a microscopic examination of the body fluids, etc., often fails to reveal the causative organism, although it may occasionally be found in the serous exudate of the plaques and also in the fluid obtained from the affected genital organs and in the edematous fluid obtained from the affected genital organs of stallions and mares. In Montana only a limited number of animals were clinically affected.

In view of the necessity for a ready means of diagnosis, the application of the complement fixation method has been attempted, using some diseased horses sent to the experiment station at Bethesda, Md. The problem of greatest difficulty has been the question of an appropriate antigen. "From time to time, as these animals died, certain tissues were obtained which it was suspected might furnish the desired results, but although shake extracts of the spleens, livers, kidneys, and bone marrow, as well as alcoholic and acetone preparations, were employed under various conditions, the results were rather discouraging."

From the literature it appears that the best results may be obtained from the use of suspensions of pure trypanosomes. "In place of the specific trypanosome of dourine being utilized, the writers selected the surra organism, as it had been previously ascertained by several investigators that the reaction obtained was not absolutely specific for any one trypanosome infection but was rather of a group nature." In a part of this work, instead of straight suspensions an antigen was made of the blood and macerated spleens of rats killed at the height of surra infection. The material was placed in a bottle containing glass beads, then shaken for 6 hours, filtered through gauze, and carbolic acid added to the filtrate.

The smallest quantity of serum from horses which gave a positive reaction was 0.05 cc., but the various comparative tests indicated that fixation in tubes containing 0.2 cc. of serum was sufficient for diagnostic purposes. The sera from normal animals, or those affected with diseases other than trypanosomiasis, did not react. As the method of preparing antigen described above did not later always give satisfactory results, antigen was prepared by drawing the blood of an infected dog into centrifuge tubes containing an equal amount of 1 per cent potassium citrate solution. The red blood corpuscles were cytolized with saponin, the mixture centrifuged, and the supernatant fluid drawn off. The opaque mass or residue after repeated washing with sodium chlorid solution was emulsified and titrated. This antigen proved very satisfactory with the blood from the horses in the Montana outbreak, but a more rapid method proved essential.

"Various organs from rats just dead from surra were tried out in both fresh and preserved states, and the results which were obtained from the fresh suspension of the macerated spleen of a rat just dead from surra were the most promising. . . . After repeated tests on horses clinically affected with dourine had shown the antigen to be uniformly constant in its action, the procedure of diagnosing dourine by this method was definitely adopted. . . .

"Gray or white rats are infected with surra by the injection of 0.2 cc. of blood from a rabbit infected with that disease. Since tests have to be made every day to keep up with the large number of cases submitted and as the antigen proves effective only when prepared fresh, it was arranged that at least 2 rats should die daily with the disease. When the rats appeared to be at the point of death late in the afternoon it was found that placing such rats in the ice chest until they died furnished a better antigen than when they have died in the cage during the night and have to be used the following morning. The spleens of the rats are removed, placed in a mortar, and ground up with a small amount of salt solution to a pulpy mass. From time to time more of the salt solution is added, and the suspension thus obtained is filtered twice through a double layer of gauze into a test tube. The quantity of the suspension from each spleen is made up to 40 cc. by dilution with salt solution. This suspension constitutes the antigen for the tests of the suspected dourine sera. . . . Occasionally the antigen does not prove satisfactory for the test

and has to be discarded. In these cases the fixation in all tubes is apparently due to the excessive amount of proteids from the spleen. Experience has shown that the excessively large spleens contribute such an antigen. . . .

"The test proper for the diagnosis of dourine is carried out in a manner similar to that practiced for the diagnosis of glanders [E. S. R., 25, p. 181]. . . . Since the testing has been undertaken by the method described, 8,657 samples have been examined from Montana and the Cheyenne and Standing Rock Indian Reservations in North Dakota and South Dakota. Of these 1,076 gave positive reactions, which appears to be a very large proportion, but when it is remembered that these animals were kept under range conditions without sanitary or veterinary control and also that before the disease was recognized as dourine it had been diagnosed for a long period as some other affection, it will be apparent that the opportunity for the spread of the disease was ideal. With the present system of diagnosis, by which even the latent cases can be determined, it is hoped to eradicate the disease quickly."

A bibliography is appended.

RURAL ENGINEERING.

Pumping plants, F. C. KELTON (*U. S. Geol. Survey, Water-Supply Paper 320, pp. 187-213, pl. 1*).—In cooperation with the Arizona Experiment Station, tests of 20 representative irrigation pumping plants in the Sulphur Spring Valley are reported, the object being to ascertain the initial cost, consumption, and cost of fuel, yield of wells, and general efficiency. All the plants tested were of the distillate centrifugal type, 18 being horizontal and 2 vertical pumps. The actual lifts varied from 18 to 73 ft. and the yields ranged from 69 to 1,080 gal. per minute. Of the pumps tested the rapid speed type appeared to be the more efficient.

The two causes which were preeminent in reducing the efficiency of the plants are said to be (1) the insufficient speed maintained by the pump, and (2) the improper timing of the engine ignition. Efficiencies ranging from 8.5 to 41.4 per cent were obtained.

The cost of pumping plants per rated horsepower varied from \$40 to \$104, exclusive of cost of well and buildings, with an average of \$66. The average cost per useful horsepower was \$290. The average fuel cost per acre foot of water pumped was \$4.39 with distillate at 16½ cts. per gallon in the northern part of the valley and 17½ cts. in the southern part, 5 per cent being allowed for losses by leakage and evaporation.

Details and design of headgates, B. A. ETCHEVERRY (*Jour. Electricity, 30 (1913), No. 11, pp. 248-251, figs. 7*).—This article deals with headgates and gate lifting machinery, describing the lever types, inclined plane types, pulley types, and a lever combined with inclined plane or gearing. The mathematical and mechanical principles of each are analyzed, and formulas for the design of the parts are derived.

Inverted siphon construction, B. A. ETCHEVERRY (*Jour. Electricity, 30 (1913), No. 25, pp. 578-581, figs. 5*).—This article calls attention to the necessary auxiliaries to inverted siphon construction, namely, wasteway and sand box, anchorage, air outlet and inlet valves, and blow-offs. It describes the details of the design and construction of several inverted siphons in use on private irrigation projects, on the Umatilla and Belle Fourche projects, and on irrigation projects in Spain. Special attention is called to different methods of reinforcing the siphon proper, to types of inlet and outlet, and to novel methods for draining away seepage water.

Land clearing, A. J. McGUIRE (*Minnesota Sta. Bul. 134, pp. 32, figs. 22*).—The only practical methods of clearing land of stumps in use by farmers in northern Minnesota are said to be blasting and the use of the horsepower stump puller. The stump puller is considered most economical for small stumps, while for stumps so large that they can not be handled and burned when they are pulled, blasting is said to be best. "For very large stumps or green stumps the combined use of explosives and the stump puller gives the most satisfactory results." For the lowest cost and quickest results it is suggested that all trees and brush be removed at one time and a pasture or meadow established to keep down brush and bring returns. Green stumps over a foot in diameter should not be removed unless immediate cultivation is necessary as they may be removed more readily after a few years and the soil will be in a better condition. "When an explosive is used it should be placed under that part of the stump which will offer the greatest resistance, usually the center. The depth at which to place the explosive under the stump may generally be estimated by the diameter of the stump at the ground line."

"For removing stumps from clay or clay loam soil the lower grades of dynamite, 25, 27, and 30 per cent are quite equal to the higher and more expensive grades, 40 and 60 per cent. They are cheaper, less dangerous, and leave the soil in better condition." It is claimed that an explosive known as "virite" is being used successfully when the soil is not wet. It is said to be somewhat cheaper than dynamite, does not produce headache, and does not freeze. "A pound of explosive should be used for each foot of diameter of the stump, if it has been cut some time. From $1\frac{1}{2}$ to $1\frac{3}{4}$ lbs. per foot in diameter should be used for green stumps."

Dynamite is said to work best in wet soil when the earth is thoroughly tamped over, if care is taken not to tamp directly on the dynamite. Virite requires a soil free from water and must not be compressed at all as it will not explode, so that only the upper part of the hole should be thoroughly tamped.

The methods of priming, blasting, and firing charges are reviewed and warnings given as to the danger of improper procedure and carelessness. In this connection, it is suggested that before using dynamite methods of handling it be studied and that, if possible, an experienced man be employed for a day or two as an instructor.

Vitrified brick as a paving material for country roads, V. M. PEIRCE and C. H. MOOREFIELD (*U. S. Dept. Agr. Bul. 23, pp. 34, pls. 10, figs. 3*).—It is the purpose of this bulletin "to furnish information relating to the construction of brick roads and to supply suggestions for aiding engineers in preparing specifications under which such work may be satisfactorily performed."

The principal advantages of brick roads are stated as follows: (1) They are durable under heavy traffic conditions, (2) they afford easy traction and good foothold for horses, (3) they are easily maintained and kept clean, and (4) they present a very pleasing appearance. The principal disadvantage is the high first cost. One of the most essential features is stated to be the selection of the brick, and in this connection a brief discussion of raw materials and processes of manufacture, general physical characteristics of the perfect finished product, and field and laboratory tests is given.

In the construction of brick pavements or roads the essential features to be considered in preparing the subgrade are enumerated as (1) thorough drainage, (2) firmness, (3) uniformity in grade and cross section, and (4) adequate shoulders. Brick pavements should be supplied with strong durable curbs of stone, Portland cement concrete, or vitrified clay shapes, both on the sides and

at the ends. A firm unyielding foundation is a most essential feature, the proper type to be used depending largely on the material composing the subgrade and the character of traffic for which the road is designed. Where the traffic is comparatively heavy or where the material composing the subgrade is defective in any way a monolithic concrete foundation should be used. An adjustable cushion of fine sand, usually 2 in. in thickness, is necessary between the foundation and brick for correcting slight irregularities in the foundation. The brick should be laid on edge in uniform courses running at right angles to the line of the pavement, except at intersections, and joints should be broken. After laying, the pavement should be carefully inspected to detect defective brick. To smooth out all inequalities, it should be rolled in both directions with a power roller weighing from 3 to 5 tons. In order to keep the brick in proper position and protect the edges the joints should be filled, preferably with a Portland cement grout. Longitudinal expansion joints of some firm and durable bituminous material are deemed necessary next to the curb. The thickness of joint should vary with the width of the pavement, $\frac{1}{2}$ in. being suggested for roadways 20 ft. or less in width, $\frac{3}{4}$ in. for widths of 20 to 30 ft., 1 in. for widths of 30 to 40 ft., and $1\frac{1}{4}$ in. for greater widths.

With all materials considered delivered on the work and all costs expressed in cents the probable cost of constructing the brick pavement, including the subgrade, the 6 in. concrete foundation, curbs, etc., is estimated by the formula: Cost per square yard = $1.90 L + 0.213 C + 0.138 S + 0.157 A + 0.045 B$, in which C equals cost of cement per barrel, S cost of sand per cubic yard, A cost of coarse aggregate per cubic yard, B cost of paving brick per thousand, and L cost of labor per hour. Ten per cent should be added to allow for wear on tools and machinery and for unforeseen contingencies. Each inch subtracted or added to the thickness of foundation will make a corresponding difference of from 8 to 12 cts. in the cost per square yard.

Typical specifications for the construction of brick roads are presented, and a method for inspecting and testing paving brick is appended.

In conclusion the importance of proper engineering supervision is emphasized, and it is stated that since brick pavements are probably more expensive to construct than any other type of country road it is important that their construction should be carefully planned and well executed.

The production of sand and gravel in 1912, R. W. STONE (*U. S. Geol. Survey, Advance Chapter from Mineral Resources of the United States, Calendar Year 1912, pp. 18*).—Data are given showing the production of sand and gravel for various purposes in the various States during 1912. The total production is reported as 68,318,877 short tons, valued at \$23,081,555, a net increase in quantity of 1,471,918 short tons and in value of \$1,922,972 over the production of 1911.

Tests of the strength of cement (*Concrete-Cement Age, 2 (1913), No. 5, pp. 257, 258*).—In an abstract of a paper read by H. C. Johnson before the Concrete Institute at London are given the tabulated results of tests of 16 different brands of cement and mixtures thereof, conducted to emphasize the need of testing all materials, and comprising tests for tension, compression, binding, and effects of varying percentages of water. The author's conclusions are that a good strength in paste is no proper indication of a good strength in concrete; that the best tests of a cement's value for reenforced concrete or similar work are mortar compressions cured in water and in air; that any cement having a higher value in air than in water ought to be condemned; that not less than 22 per cent of water should be allowed in gaging paste and not less than 3 per cent plus $\frac{1}{4}$ the percentage as used in the paste in gaging mortar; that the standard of values for cement to be used in reenforced con-

crete work should be raised by 25 per cent; that a given strength of concrete should be specified instead of a given mix; and that cement should be sold by volume instead of weight and in paper bags containing 1 cu. ft.

Test of a kerosene oil engine, H. D. WILE (*Elect. World*, 62 (1913), No. 8, p. 389, fig. 1).—The engine tested resembles the ordinary 4-stroke-cycle, throttling-governor, stationary engine with mechanically operated valves and make and break ignition. A 7.5 K. W. generator was directly connected. The mixer, situated on top of the cylinder, supplies both water and fuel, which are atomized by the piston suction. Four series of tests were made as to jacket water temperature, time of ignition, amount of water in the cylinder, and economy run.

The most efficient jacket water temperature was found to be around 175° F. and the best angle of advance of ignition was 36, as compared with the average angle of 16° for gasoline engines. Water in the cylinder performs four duties, namely, prevents rapid explosions, excessive pressures, high temperatures, and the heavy deposit of carbon on the walls of the cylinder. Other points brought out are that the best ratio of kerosene to water in the mixer was as 3:1 and that the addition of more water decreased the thermal efficiency; that the percentage of heat absorbed by the jacket water was approximately 16 per cent; and that the heat lost in radiation and exhaust was approximately 55 per cent. The fuel economy was considered good, 0.872 lb. of kerosene per brake horsepower being the lowest consumption, which indicates that nonvolatile or low-grade fuels can be burned successfully in small units.

Comparison of cost of fuel for oil, gas, and steam engines and current for electric motor, W. A. KRITZER (*Gas Engine*, 15 (1913), No. 6, pp. 316, 317).—Several tables of data are given showing the cost of fuel per brake horsepower for 1 hour, for 24 hours, for 300 days of 10 hours each, and for 300 days of 24 hours each, using the maximum, average, and minimum prices for the fuel.

Wind power, VOGDT (*Deut. Landw. Presse*, 40 (1913), No. 49, pp. 590, 591, figs. 3).—The results of experiments with wind power indicate that the pressure of the wind on a wind motor per unit area increases with the square of the wind velocity, and the horsepower with the cube of the wind velocity, including skin friction. Under these conditions it is stated that the speed of a windmill wheel is directly proportional to the wind velocity. On this basis the following formula is suggested to determine approximately the available power of a windmill for certain wind velocities:
$$N = \frac{y \times F \times v^3}{150g}$$
. In this y equals the weight of 1 cubic meter of air in kilograms; F the average area in square meters of the windmill wheel at right angles to the direction of the wind; v the wind velocity in meters per second; and g 9.81 meters per second or the acceleration due to gravity. In this connection it is claimed that the efficiency of the wind power plants which have been tested vary between 65 and 80 per cent. The operations of several wind motors are described.

Electricity on the western farm (*Jour. Electricity*, 30 (1913), No. 25, pp. 576, 577).—This article gives operating data and rate schedules of several power companies supplying electrical power to farms throughout the Western States.

The rate schedules show a great difference in the methods of charging for power and the amount of the charge. The greatest demand for electrical power appears to be for irrigation pumping, so that the use of electricity in these cases is necessarily a seasonal use. It is concluded, therefore, that it is to the advantage of power companies to have the consumer make his installation small

and operate as many hours per day as possible in order to cut down the power company's plant investment and increase the return per unit of installed capacity.

Traction farming and traction engineering, J. H. STEPHENSON (*Chicago, 1913, pp. 330, figs. 151*).—This is a practical handbook for owners and operators of gasoline, alcohol, and kerosene engines on the farm, comprising descriptions of some of the makes of farm tractors with directions for their care and operation, and also two chapters by S. E. Brown on water supply and electric lighting systems for the farm. A section is devoted to threshing machines and the science of threshing. Chapters on the operation of gas and oil engines are as follows: The gasoline farm tractor, fuel consumption of gas engines, alcohol as fuel, kerosene as fuel for traction engines, balancing of engines, piston rings, valves, leaky pistons, the cylinder, the carbureter, modern ignition, vaporizing of fuel, cooling systems, lubrication, horsepower calculations, and gasoline engine troubles.

The care and repair of rubber belts, R. MOORE (*Power, 38 (1913), No. 4, pp. 145, 146, figs. 5*).—This illustrated article gives instructions for splicing and stitching rubber and canvas belts. The use of rubber belts on too small pulleys is not recommended, since the resulting inside compression and outside tension is likely to separate the plies. It is stated that animal fats and grease should never be used as dressing on rubber belts, but that boiled linseed oil is good, and also equal parts of black lead, red lead, French yellow, litharge, and enough Japan drier to make it dry quickly.

The construction of creameries, M. MORTENSEN and J. B. DAVIDSON (*Iowa Sta. Bul. 139, pts. 1, pp. 126-146, figs. 11; 2, pls. 21*).—Part 1 of this bulletin deals with the factors determining the success or failure of a local creamery, forms of organization, and data as to the location and construction of creameries as regards convenience, sanitation, heating, lighting and ventilation, and materials of construction. Eight typical creameries are described with specifications for their construction and bills of material. Part 2 gives building plans for these creameries.

Modern silo construction, J. B. DAVIDSON (*Iowa Sta. Bul. 141, pp. 159-229, figs. 63*).—This bulletin covers briefly the field of Bulletin 100 of the Iowa Station (E. S. R., 20, p. 687) and Bulletin 117 (E. S. R., 23, p. 590) and adds descriptions of several recent developments in silo construction, among which are the wooden hoop silo, pit silo, and the Iowa silo used as a water tower. In the last the silo walls are designed of sufficient strength to support a water tank for the general farm supply. The success of this method is to be reported in a later bulletin.

RURAL ECONOMICS.

A normal day's work for various farm operations, H. H. MOWRY (*U. S. Dept. Agr. Bul. 3, pp. 44*).—Notes and data based in part on personal observations and in part on replies to a circular of inquiry sent to 25,000 selected farmers as to the average or normal day's work for various farm operations are presented. Tables are given illustrating a normal day's work in using walking, sulky, and gang plows; plowing stubble and sod with a traction engine; using spike-tooth, spring-tooth, and disk harrows, a land roller, a grain drill, a broadcast seeder, knapsack sower, and wheelbarrow sower; in planting cotton, corn, sweet potatoes, Irish potatoes, cabbage, and tomatoes; cutting potatoes for seed and covering same after planting; making rows for planting; hauling and spreading manure with a spreader and by hand and

dumping manure in piles; cultivating corn, potatoes, beans, cabbage, and cotton; spraying an orchard; mowing, raking, tedding, and cocking hay; harvesting hay and corn with and without a binder; husking corn; digging potatoes; threshing grain; hauling to market with wagon; together with a number of other farm operations, giving the average work factors in terms of designated units per man, per horse, per hour, per day, etc.

Among the author's conclusions are the following:

"Daily and seasonal working factors for farm labor and equipment are of primary importance in farm organization and management.

"The seasonal and daily duty of men and equipment for an agricultural area can be reliably approximated by averaging many estimates for each operation made by farmers in the region. Figures so obtained are as accurate for practical purposes as those secured by more refined methods. . . .

"Those engaged in farming have quite definite conceptions of the duty for the simpler operations where but one or two men and one or two teams are involved. Where many men and units of equipment are used in an operation there is less definite conception of what constitutes a fair day's work, since fewer have had experience with the large crews, and the range of variation is greater. More data are therefore necessary to insure useful averages.

"With implements of heavy draft and also with many of the lighter implements, the increase in dimensions is not attended with proportional increases in work accomplished. . . .

"The increase in the number of men in the crew and in the complexity of the operation are attended by lost motion and decrease in efficiency per unit of labor and equipment. The simpler operations are the most economical from the standpoint of work done daily."

To work a grass holding at a living profit, and the cheap cottage problem, H. B. M. BUCHANAN (*London, 1910, pp. 102, figs. 3*).—This book discusses the problem of producing a hay crop, and the management of cows, pigs, and poultry on a small holding.

Land tenure in England and Norway, E. SUNDT (*Economist, 77 (1913), No. 3662, pp. 965, 966*).—This article discusses and illustrates the effect of feudalism upon agriculture and agricultural population, the author holding that the general exodus from the farm to towns and cities in England is due largely to the system of land tenure, particularly the entailing of property. Free trade in land is thus impossible, and the country is accordingly "doomed to a continuation of farming by tenants."

Irish agricultural laborers, 1912 (*Dept. Agr. and Tech. Instr. Ireland, Agr. Statis. 1912, pp. 45*).—This report submits notes and tables showing the number and earnings of Irish migratory agricultural laborers, the wages of agricultural laborers, and the number of persons engaged in farm work, together with the number and power of the various agricultural machines and implements in use in Ireland in 1912.

The total number of agricultural laborers is shown to have decreased from 509,344 in 1871 to 199,900 in 1911. There is also as much complaint among the farmers of the loss of efficiency of the laborers as of the difficulty in securing them.

The total number of persons engaged in farm work on June 1, 1912, is reported at 1,073,238.

Persons engaged in agricultural pursuits in Prussia, HAGMANN (*Mitt. Deut. Landw. Gesell., 28 (1913), No. 34, pp. 483-486*).—This article presents notes and tables showing observations made from the census of the agricultural

population of Prussia in 1907. The following table shows the number of persons engaged on different-sized farms:

Persons actively engaged in agriculture in Prussia.

Size of farm.	Kind of labor.			Number of persons per 100 hectares.
	Male.	Female.	Total.	
Under 2 hectares.....	747,559	1,846,911	2,594,470	259.5
2-5 hectares.....	673,416	824,383	1,497,799	87.7
5-20 hectares.....	1,273,995	1,244,343	2,518,338	43.4
20-100 hectares.....	754,476	620,171	1,374,647	20.9
100 hectares and over.....	602,992	432,278	1,035,270	17.5
Total.....	4,052,438	4,968,086	9,020,524	43.0

Other tables are given showing the number of persons engaged in agriculture in each Province or subdivision, also the kind of work in which they are engaged.

Depopulation of rural districts in France, W. H. HUNT (*Daily Cons. and Trade Rpts.* [U. S.], 16 (1913), No. 210, pp. 1386, 1387).—This report shows that according to an inquiry made by the minister of agriculture the number of persons employed in agricultural pursuits in France decreased from 4,000,000 in 1862 to 3,000,000 in 1892 and to 2,320,000 in 1913, or a decrease of about 40 per cent in half a century. "Irregular work, long periods of enforced idleness, poverty resulting from bad harvests, frequent recurrence of certain calamities—hail, blight, mildew, etc.—induce them to abandon the soil and look elsewhere for better-paid work."

Data are given showing the working hours and farm wages for day laborers in different sections of the country.

Condition of Danish agriculture during 1911 (*Tidsskr. Landökonomi*, 1912, Nos. 7, pp. 434-463; 8, pp. 489-504; 9, pp. 537-553; 12, pp. 698-721; 13, pp. 761-778, 779-795).—The general condition of Danish agriculture in its various phases during the year 1911 is discussed in this volume by different specialists, as follows: Animal husbandry, by A. Appel; horse raising, by J. Jensen; crop production, by K. Hansen; Denmark's trade in agricultural products with foreign countries, by N. C. Christensen; dairy exports, 1911-1912, by B. Bøggild; and meteorological conditions, 1911-12, by H. Hansen.

[Area, population, agricultural production, etc., in Canada, 1911-12] (*Canada Yearbook*, 1912, pp. 1-301).—This is an official publication giving in addition to other data a statistical census as to area, population, agricultural production, imports, exports, etc., of Canada for 1911-12 by Provinces and Territories, with comparison with former periods in a number of instances.

Tables showing the urban and rural population give for the whole country 3,280,964 of the former, an increase of 62.28 per cent over 1901; and 3,925,679 of the latter, an increase of 17.20 per cent during the same period. In the Provinces of Prince Edward Island, Nova Scotia, New Brunswick, and Ontario there has been an actual decline in the rural population since 1901, but a marked increase in the urban population.

The estimated total area under field crops in 1912 was 32,449,420 acres, yielding a harvest value of \$511,951,100. Tables are given showing the acreage, yield, value, etc., of the leading crops, together with data as to the production, value, etc., of butter and cheese in 1900, 1907, and 1910.

AGRICULTURAL EDUCATION.

Report of the temporary educational commission to the government and legislature of the State of North Dakota ([*Fargo, N. Dak.*], 1912, pp. 61).—This commission, organized in December, 1911, for the purpose of studying educational systems in the United States and elsewhere with a view to unifying and systematizing the educational system of North Dakota, outlines in this report the North Dakota educational system, what a state educational system should be, the bases of institutional organization, the scope of institutions, and the views of authorities concerning the function, control, and government of a state university.

Report of committee on agricultural education, T. E. FINEGAN (*N. Y. Dept. Agr. Bul.* 47, pp. 1253-1256, pl. 1).—This committee of the New York State Agricultural Society presents for the consideration of the society the report of the state advisory board, established in 1911 for the purpose of promoting and directing agricultural education and the advancement of country life. This report recommends "(1) that the main effort toward the introduction of agricultural education, whether through state or local aid, be directed toward the study of agricultural and rural subjects in the public high schools; (2) that in addition to those institutions already authorized to train teachers of agriculture, special and adequate provision be made for training such teachers at the State Normal College and in one or more normal schools; (3) that the state department of education give direction at a few points, distributed with reference to the leading agricultural industries, to the development of adequate teaching equipments in high schools which may serve as examples and illustrations for further extension of such equipment; (4) that the special state schools already established be developed toward teaching home economics and agricultural technology, the latter somewhat specialized for each school; (5) that the further development of the special state schools, when this may safely and wisely be accomplished, shall be made with reference chiefly to the fruit and vegetable growing interests, under which policy the southeastern and western parts of the State would be considered by the establishment of one school in each of those sections; and thereafter special schools of agriculture shall be established only if the people of a locality determine whether they desire a school and will take a substantial part in its financial support; (6) that this board favors legislation enabling cities of the first and second class to establish public schools of agriculture either within or without the limits of said cities; (7) that in schools of agriculture hereafter established, the commissioner of education, the commissioner of agriculture, and the director of the State College of Agriculture at Cornell University, shall be ex officio members of the boards of trustees."

Fourth annual report of the eleven district agricultural schools of Georgia, J. S. STEWART (*Bul. Ga. State Col. Agr.*, 1 (1913), No. 12, pp. 38, figs. 11).—Among the new features of work is the plan to give the girls some training in general agriculture as well as in care of poultry, milk, and vegetable and flower gardens, and the making of butter. The teachers' training course was taken by 53 students during the past year. It proved popular in 3 schools, and it is believed will soon become a valuable means of teacher training for rural schools. The complete course of study, which appears in the report, has again been revised.

Scientific farming on elaborate scale in the common schools, S. A. MINEAR (*Rural Educator*, 2 (1913), No. 2, p. 24, fig. 1).—According to this article there are over 4,000 schools in the State of Oklahoma teaching agriculture. About 3,500 are rural schools, all of which use agricultural text-books. Indoor experi-

mental work is carried on in 20 counties; object lessons in more than 16 counties; and school gardens, hotbeds, and outdoor experimental farms in more than 8 counties.

People's high schools in Denmark, C. G. RATHMANN (*School and Home Ed.*, 33 (1913), No. 2, pp. 51-54, figs. 3).—A brief statement concerning the establishment and objects of people's high schools in Denmark is followed by an outline of the daily program at the school at Wallekilde on the island of Zealand, which has an agricultural course.

The girls' agricultural school at Berlaer, C. C. PERVIER (*Nat. Stockman and Farmer*, 37 (1913), No. 18, p. 5, fig. 1).—A brief report is given on this Belgian school, which is solely for teaching practical and theoretical agriculture and dairying to farm girls and is under the supervision of nuns who also teach the girls household work of every kind. The girls do all the work of planting and harvesting on the 30-acre farm and of caring for the dairy herd. A 4-year course is offered, of which the fourth is devoted to agriculture. The government appropriates \$2,600 per annum for the school.

Methods in agricultural schools, D. SNEDDEN (*Jour. Ed. [Boston]*, 78 (1913), No. 1, p. 18).—Among the questions recommended to be discussed fully at the earliest moment are (1) to what extent should the agricultural school be preparatory to colleges in general or to the agricultural college; (2) what should be the character of the land used by the central school of agriculture; and (3) in what ways should the course of study admit of specialization? Each of these questions is here briefly considered.

The author maintains that 2 types of schools are practicable in Massachusetts, namely, the agricultural department of an existing high school and the central or county agricultural school. In the former case the agricultural training should be in the hands of one person giving his entire time to this work, and combining in his preparation scientific training with some experience as a practical farmer; (2) all the practical work of the boys should be done on home farms, the school attempting no farming; (3) the instructor should supervise the boys' practical work during the summer months with his vacation in the winter; and (4) each agricultural pupil may also take 1 or 2 studies of a general nature. In the case of the central or county agricultural school, there should be (1) a faculty of such a size as to justify its giving exclusive attention to agricultural (and, possibly, household arts) education; (2) two classes of pupils—those from farmers' homes and those from villages or the city; (3) sufficient land to give object lessons on a small scale of good farming and also to provide city boys with opportunity for practical work; and (4) a central location.

See also a previous note (E. S. R., 29, p. 191).

Problems in the administration and teaching of agriculture, G. A. BRICKER (*Texas School Jour.*, 30 (1913), No. 10, pp. 10-12).—This paper points out that instruction in agriculture should result in some immediate economic benefit and give the pupil an intelligent desire for farm life; should prepare the boy for continuing the agricultural work in the high school; and should be adapted to his nature and capacity. Attention is called to the importance of differentiating between agricultural nature study and elementary agriculture.

The redirection of the rural school, W. R. HART (*Rural Educator*, 2 (1913), Nos. 1, pp. 4, 5, 10, fig. 1; 2, pp. 18-20; 3, pp. 34-36).—This article discusses in a comprehensive way a number of psychological considerations entering into agricultural instruction, which the author believes increases the productive efficiency of education, aids in disciplining the mind, and satisfies to a large extent the demands of intellectual culture.

Agricultural training courses for employed teachers, E. R. JACKSON (*U. S. Dept. Agr. Bul.* 7, pp. 17).—In addition to a discussion of the means by which

employed teachers may acquire agricultural training, this bulletin contains lists of institutions maintaining courses in agriculture in summer sessions, institutions offering special short courses or extension courses in agriculture for teachers, correspondence and reading courses in agriculture, and a suggested reading course in agriculture based on Farmers' Bulletins and other free publications of this Department.

Subject matter in nature study and elementary agriculture (*Cornell Rural School Leaflet*, 7 (1913), No. 1, pp. 212, figs. 165).—This publication presents lists of subjects for 1913-14 in nature study and elementary agriculture as outlined in the New York State Syllabus. In addition to illustrative material for a special study of birds, animals, insects, plants, and trees, charts are given showing how a farm may be laid out and school grounds planted to trees, small shrubbery, etc.

Nature study and agriculture (*In Course of Study of the Elementary Schools of Oregon*. Salem, Oreg.: State Dept. of Ed., 1911, pp. 56-65).—This is an outline of the optional work in nature study in the first to the fourth grades, inclusive, and in agriculture in the seventh and eighth grades in one class.

Woodworking exercises for the agricultural school shop, H. B. WHITE (*Minnesota Sta. Bul.* 135, pp. 39, figs. 35).—The greater part of this bulletin consists of drawings and photographs showing the exact measurements of 30 exercises in carpentry work suitable for class work and not requiring the use of machinery. The descriptive matter is practically limited to lists and tabulated information.

Demonstration-lectures in domestic science (foods and cooking), sewing, and home nursing (*Ontario Dept. Agr. Bul.* 215, 1913, pp. 19, figs. 5).—Outlines of the courses are given, with a statement of some of the benefits derived from such work.

Sending the college to the State (*Mass. Agr. Col. Bul.*, 5 (1913), No. 5, pp. 16).—This pamphlet describes briefly the extension methods adopted by the Massachusetts Agricultural College, giving outlines of the various lines of work, with suggestions as to how individual farmers may secure special information.

MISCELLANEOUS.

Annual Report of Guam Station, 1912 (*Guam Sta. Rpt.* 1912, pp. 29, pls. 6, figs. 7).—This contains a summary of investigations by the special agent in charge, for the most part abstracted elsewhere in this issue.

Annual Report of West Virginia Station, 1912 (*West Virginia Sta. Rpt.* 1912, pp. 308, figs. 100).—This contains the organization list; a report of the director on the organization, work, and publications of the station, including a financial statement for the fiscal year ended June 30, 1912; departmental reports, the experimental work in which is for the most part abstracted elsewhere in this issue; reports to December 30, 1911, of work under state appropriations for the destruction of plant and insect pests and the promotion of the horticultural and trucking industries, portions of which are abstracted elsewhere in this issue; and reprints of Bulletins 135-137 and 139-141 and Circular 5 previously noted, and of Circulars 4 and 6 noted elsewhere in this issue.

A list of bulletins available for general distribution (*West Virginia Sta. Circ.* 4, pp. 2).

From the letter files of S. W. Johnson, edited by ELIZABETH A. OSBORNE (*New Haven, Conn.*, 1913, pp. 292, pls. 3).—Extracts from the letters and earlier writings of the former director of the Connecticut State Experiment Station, with a bibliography. Noticed editorially on page 1 of this issue.

NOTES.

Arkansas University and Station.—A 3 months' short course in agriculture has been established and opened with a good attendance. Domestic science courses have also been offered for the first time, more applicants being received than could be accommodated.

W. C. Thompson, assistant in animal husbandry, has resigned to become experimentalist in poultry husbandry at the New Jersey State Station and has been succeeded by D. H. Branson, animal husbandman at the Kansas College and Station. W. H. Wicks of the Idaho University and Station has accepted the position of horticulturist made vacant by the resignation of Ernest Walker, previously noted. L. H. Seymour, assistant in horticulture, has resigned to accept a commercial position.

Maryland College.—J. E. Metzger, a graduate of the Pennsylvania College and director of agriculture in the agricultural high school at Fergus Falls, Minn., has been appointed professor of agricultural education beginning January 1. He will begin his duties with a survey of the work now being done in the rural schools of the State in teaching agriculture and other vocational subjects. B. H. Darrow, a graduate of the Ohio State University and principal of the agricultural high school at Marion, Ohio, has been appointed Y. M. C. A. secretary, and in addition to his work at the college will make a survey of rural churches and do extension community work through the Y. M. C. A. and churches of the State.

Massachusetts College.—Associate professors Lockwood and Graham have been advanced to full professorships in dairy and poultry husbandry, respectively. E. M. McDonald has been promoted to the assistant professorship of agronomy.

Michigan College.—George R. Johnstone and Ford S. Prince, 1913 graduates of the University of Illinois, have been appointed instructors in botany and soils, respectively. F. A. Wilken, who has had charge of the substation at South Haven, resigned November 1, 1913.

Nebraska University and Station.—Frank C. Dean has been appointed agricultural editor beginning January 15.

Nevada University and Station.—Dr. P. B. Kennedy, who has had charge of the department of botany, horticulture, and forestry since 1900, resigned January 1 to become assistant professor in agronomy in the University of California. Dr. Maxwell Adams, professor of chemistry, has been granted a year's leave of absence for study in Europe.

North Dakota College and Station.—H. O. Werner has been appointed instructor in horticulture and assistant horticulturist.

Ohio State University and Station.—A census of the freshman boys shows that 56 per cent come from the farm, 39 occupations other than farming being represented, some of them in considerable numbers. Work on the new green-houses for which \$5,000 has been appropriated will be begun in the near future. Special attention is to be given to floriculture.

In the station, J. H. Muncie, assistant botanist, has accepted the position of assistant pathologist in the Michigan Station and has been succeeded by Richard C. Walton. W. M. Cook and M. O. Bugby of the department of cooperation have been detailed as acting county agents for Greene and Trumbull counties, respectively, with headquarters at Xenia and Warren.

Oregon College.—Schools of forestry and mines have been organized with George W. Peavy, formerly head of the department of forestry, and Henry Martin Parks, professor of mining, as the respective deans. G. D. Horton (M. S., Yale, 1913) has been appointed instructor in bacteriology.

The course in agriculture offered during Farmers' Week in December, 1913, attracted more than 600 farmers. Special attention was given to cooperative marketing and rural organization, addresses being given by experts in associated industries and by Dr. Hector Macpherson, the Oregon member of the American commission on European cooperative systems. More than 200 farmers and housewives registered for the short course beginning January 5.

Arrangements have been made by the extension director and the superintendent of the State Department of Education for cooperative management of the various district, county, and state school fairs. According to the revised plans for holding the fairs more emphasis will be placed on method and less on result. The exhibit system will be progressive, winners in the local fairs been eligible to make entries in the next higher fair. Exhibitors in the state fair will be given instruction in agricultural subjects and possibly provided with a summer camp while the fair is in progress.

Porto Rico College.—F. L. Stevens, dean of the college of agriculture and professor of vegetable pathology, has been appointed professor of plant pathology in the department of botany of the University of Illinois.

Washington College.—W. O. Ellis has been appointed instructor in entomology.

U. S. Department of Agriculture.—The investigations conducted for several years by the Dairy Division in soft cheese making at the Connecticut Storrs Station, on the ripening of Cheddar cheese at the Wisconsin Station, and on milk secretion at the Missouri Station, have been discontinued. Dr. Charles Thom, J. M. Currie, and K. J. Matheson are to continue the soft cheese work at Washington.

Miss A. C. Evans, assistant bacteriologist at the Wisconsin Station, and P. A. Wright, assistant chemist at the Missouri Station, have also been transferred to Washington, where they will undertake work in the bacteriology and chemistry of milk and its products along lines similar to those in which they were previously engaged.

Commission on Meat Supply.—A commission to investigate the economic causes of the present condition of the meat industry, with a view to suggesting possible methods of improvement, has been appointed by the Secretary of Agriculture. The personnel of the commission is as follows: Assistant Secretary B. T. Galloway, chairman; President H. J. Waters of Kansas; Dean C. F. Curtiss of Iowa; H. W. Mumford of Illinois; Dr. A. D. Melvin of the Bureau of Animal Industry; and Dr. T. N. Carver of the Rural Organization Service.

Sixth Graduate School of Agriculture.—Arrangements are being completed for the sixth session of the graduate school, which will be held at the University of Missouri June 29 to July 24. Dr. A. C. True, director of this Office, will again serve as dean, and the faculty will include leading scientists and experts from this Department, the agricultural colleges and experiment stations, and other universities, colleges, and scientific institutions in America and Europe.

Instruction will be offered under the following general heads: Genetics, agronomy, horticulture, animal husbandry, immunity and disease resistance in

plants and animals, and rural economics and sociology, including farm management.

The course in genetics, comprising 40 lectures and 12 seminars, will include a systematic presentation of the present status and outlook of the subject with special reference to its agricultural relations. The hours of this course will be so arranged that it will be open to all students.

The courses in agronomy and horticulture will deal mainly with special problems in the breeding and nutrition of field crops and orchard fruits respectively, and that in animal husbandry with breeding and nutrition with particular reference to beef and dairy cattle.

The course in immunity and disease resistance in plants and animals will include a résumé showing the present status of knowledge in these lines and the outlook for future investigations. In connection with this course, conferences of phytopathologists and veterinarians in separate groups are to be arranged on special problems in plant and animal diseases.

The course in rural economics and sociology, including farm management, will present a survey of the present status of these subjects and discussions of plans for their future development.

Special arrangements are to be made by which groups of students may study in some detail the methods, records, and equipment of the research work in progress at the Missouri University and Station. General principles regarding the organization and work of institutions for agricultural research and education will also be discussed in a series of conferences.

Correspondence relating to the membership in the school should be addressed to A. J. Meyer, Registrar, College of Agriculture, Columbia, Mo.

Society for the Promotion of Agricultural Science.—The thirty-fourth annual meeting of the society was held at Washington, November 11, 1913. Two joint sessions were held with the American Society of Agronomy, which met at the same time.

The address of the president, Dean E. Davenport, was on the subject, *How Will Extension Work React Upon Research?* The effect of the present popularity of demonstration and extension work on the popular mind, on appropriating bodies, on students, and on the standards of work was traced. This effect was felt to be such that "we may well feel solicitous for both the college and the station, especially for the latter, which can not hope to compete either in spectacular show or in immediate promise with its younger but robustious brother, the extension service." The responsibility was placed upon those in authority to "insist upon and to maintain at all cost a proper balance between real research and all other agencies for agricultural progress, however attractive, however expedient, however necessary."

In a paper on *Feeding Experiments to Determine the Availability of Protein*, B. L. Hartwell and R. A. Lichtenthaler reported work conducted with chickens in which beef scrap and cotton-seed meal were compared on the basis of the nitrogen recovered in analysis of the meat. The method brought out no important difference in availability of the two concentrates.

The Nutritive Values of Organic and Inorganic Phosphorus were considered in a paper by E. B. Forbes, based on an analysis of a large body of literature relating to work with various kinds of animals, and including some by the author with swine. A lack of harmony was found in the results with different kinds of animals, which could not be explained. The results were not thought to warrant final conclusions, but "the problem now seems to take the form of a question as to whether we shall regard organic phosphorus compounds as of superior nutritive value because of the chemical relationship of their phos-

phoric acid, or because of the presence of other unknown substances of value associated with them in natural foods."

The Theory of Antagonism of Salts and Its Significance in Soil Studies was presented by C. B. Lipman, who reported studies of the effect of certain combinations of alkali salts in barley cultures and upon soil organisms. Antagonisms were quite pronounced, which suggested the possibility of chemical means for alkali reclamation.

In a paper on The Relation of Ecology to Agriculture, L. H. Pammel presented an argument for the importance of such studies in connection with other lines of agricultural work.

Variation in the Tongue Color of Jersey Cattle was traced by Raymond Pearl, in a herdbook study of registrations made in 1893 and in 1913, twenty years apart. The results indicated "a simple case of Mendelian inheritance, in which pigmented tongue is the dominant character and nonpigmented the recessive."

F. W. Rane described What Massachusetts Has Accomplished for Science in Her Fight Against the Gipsy and Brown-tail Moths. This related to the importing and breeding of parasites and other natural enemies, the development of improved spraying machinery and insecticides, and forest management as a factor in moth control.

A paper on Factors of Efficiency in Farming, by W. J. Spillman, is to appear later as a Yearbook article.

The International Institute of Agriculture was described by A. C. True, who gave an account of the organization and operations of the institute, its general progress, and the fourth session of the General Assembly, held at Rome in May, 1913 (E. S. R., 29, p. 1).

Agricultural Education in Latin America was described by Clinton D. Smith, who recently served as director of the agricultural school at Piracicaba, Brazil. He gave accounts of the various agricultural schools in Brazil, and also in Uruguay, Argentina, Peru, and Chile.

The officers elected for the year were as follows: President, President H. J. Waters of Kansas; secretary-treasurer, Dr. E. W. Allen, Washington, D. C.; executive committee, Dr. H. P. Armsby, Dr. W. H. Jordan, and Dr. H. L. Russell; custodian and assistant custodian, Dr. W. J. Beal and Prof. W. D. Hurd, of Massachusetts.

American Association for the Advancement of Agricultural Teaching.—This association held its fourth annual meeting in Washington, November 11, 1913.

The opening topic was Home Project Work *v.* Laboratory and School Garden Plat Work for High School Students. C. G. Selvig of Crookston, Minn., held that the purpose of agricultural high schools is to train future farmers and to help farmers to become more efficient. The use of school land should, therefore, be to supply plats to landless pupils and to perform demonstrations for the benefit of the school and the community. An inquiry conducted by him indicated that the possibilities regarding the use of land at school and at home are barely beginning to be realized. W. R. Hart of the Massachusetts Agricultural College assigned a different function to the agricultural high school, maintaining that the work of the high school along agricultural lines should be cultural as well as vocational and that the home projects should be for cultural training as well as for economic purposes.

A. V. Storm of the University of Minnesota discussed the preparing of teachers of agriculture at the agricultural college through a special four-year course by special instructors, as compared with adding an elective of one year of pedagogics and practice teaching to the regular agricultural course. In his opinion, "in institutions where thorough preparation of teachers of agriculture

is the aim, most of the agricultural work should be taken in the regular courses, though by cooperation between the agricultural and pedagogical teacher a few special courses might be arranged, but even these should be taught by the agricultural specialist. The professional work should not be confined to one year but should be extended through the last two years with the privilege of taking some of it in the second year if the student desired. This professional work must include, among other things, the proper organization of the agricultural material into teachable form and practice in teaching it in that form. In institutions where only limited preparation can be made, either in summer sessions or regular term, a few of the most essential regular courses should be taken, but a larger number of specially arranged courses would be permissible here than under more favorable circumstances. These should be composite courses arranged cooperatively by the department of agricultural education and the particular agricultural department or departments concerned, but should be taught by the agricultural specialist."

In discussing this paper, G. A. Bricker of the Ohio State University suggested the offering of different amounts of technical agriculture, depending upon the character of the work to be undertaken by the teacher, this to be supplemented by pedagogical training by the department of agricultural education.

In discussing the preparation of extension and field men in the agricultural college, C. H. Tuck of Cornell University contended that in addition to strong courses in the various branches of agriculture, a department of expression should be maintained, the function of which should be to discover and to develop the men peculiarly fitted by nature for the extension service. G. I. Christie of Purdue University advocated providing some practical experience in extension work for the men while still pursuing their college courses.

The scope and purpose of agriculture in secondary schools was discussed by Director H. M. Loomis of the Smith Agricultural School at Northampton, Mass., who pointed out reasons for introducing agriculture into the public schools and offered suggestions relative to methods in secondary agriculture. He held that in teaching this subject no set scheme should be followed as yet, inasmuch as secondary agricultural instruction is in a state of progress and facts learned with regard to it should be verified. This paper was discussed by T. I. Mairs of the Pennsylvania State College, who maintained that agriculture in the course of study is justified by its relation to conservation, high cost of living, economics, and general culture, and that the teaching of agriculture in the high schools creates a sentiment in favor of the subject both in the school and the community.

The committee on the use of land in connection with agricultural teaching presented through C. G. Selvig a progress report dealing with the special agricultural school. R. W. Stimson reported upon the teaching of agriculture in the public high schools, and L. S. Ivins on the same topic in the elementary schools. F. W. Howe, of Syracuse University, presented a brief progress report on the cooperative use of equipment and illustrative material. The various committees were continued.

The officers elected for the ensuing year were R. W. Stimson, president; A. V. Storm, vice-president; and W. H. French, secretary-treasurer.

American Society of Animal Production.—This society, hitherto known as the American Society of Animal Nutrition, held its fifth annual meeting at Chicago, Ill., December 3, 1913.

E. B. Forbes presented a paper entitled Mineral Metabolism Experiments with Swine, in which he described the equipment and methods employed in metabolism experiments at the Ohio Station, and gave the results of investigations on the effect of water and mineral salts and on creatinin. F. G. King

reported experiments conducted at the Indiana Station on the value of grinding and shelling corn for hogs and compared results with those obtained at other stations. Feeding trials at the Kansas Station were reported by W. A. Cochel in which he outlined the methods of finishing cattle on roughage without grain supplements. J. M. Evvard gave the results of experiments which have been conducted at the Iowa Station on the value of different pasture crops for growing pigs and brood sows.

At the evening session the topic under discussion was the meat supply. After a brief statement of the importance of this subject by the president of the society, C. F. Curtiss, the discussion was opened by H. J. Waters, in which he spoke of the needs of readjusting the live stock industry, with particular emphasis upon the necessity for its redistribution. W. A. Cochel stated that more economical use of roughage and cattle feeding and an improvement of our waste lands were important factors toward increasing our meat supply. The changes taking place in the live stock industry were described by E. W. Morse of this Department and were shown to be similar to the changes going on in many other industries. He stated that much idle land in the East and South could soon be put to profitable use for meat production.

H. P. Armsby outlined the need of more scientific investigation in connection with fundamental problems in animal nutrition and showed wherein present-day experiments are more or less superficial. A study of the market conditions was reported by H. P. Smith in which he showed the constantly increasing number of calves slaughtered, particularly in the dairy States. J. H. Skinner pointed out the necessity of farmers in the Corn Belt putting live stock on a breeding basis, rather than remaining as "finishers" of range bred cattle. The possibilities of meat production in Central America were outlined by N. S. Mayo.

Several speakers referred to the proposed legislation prohibiting the slaughtering of calves under 1 year of age, their feeling being that such legislation was unnecessary, unjust, and difficult of enforcement if enacted. It was argued that the practice is actually an economical one, since the larger number of calves are slaughtered near the large centers of population where feed is too high to make into beef. Many of the calves are not of beef type, though they make good veal at 6 or 8 weeks of age.

There was a general agreement among all the speakers that the supply of meat in the United States had not been reached, as is supposed by many people. The present situation was criticised on the basis that the meat producer is not getting the profits he should, while the consumer is paying unusually high prices. It was believed that the present shortage in meat animals will be supplied as soon as production becomes more profitable. It was voted that the president appoint a committee to confer with the Secretary of Agriculture relative to plans for the study of the meat supply problem.

Officers of the society for the ensuing year were elected as follows: President, E. B. Forbes, Ohio; vice president, J. H. Skinner, Indiana; secretary and treasurer, D. H. Otis, Wisconsin; and the committee on experiments, H. W. Mumford, Illinois, and J. H. Skinner, Indiana.

EXPERIMENT STATION RECORD.

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EXPERIMENT STATION RECORD.

VOL. XXX.

FEBRUARY, 1914.

No. 2.

There is an impression that the progress in experimental work on the feeding of farm animals is not all that might be expected or is desirable, considering the importance of the subject and the prominence it has held in the past. This feeling was voiced in the address of a former president of the American Society of Animal Nutrition, who expressed the belief that "nutrition investigations are falling behind other branches of agricultural science"—that there had not been a comparable scientific activity in comparison with other departments in the field of agriculture. Other speakers before that society have recently expressed a similar view; and such a conclusion would seem to be a fair deduction from the output in the form of publications.

This impression applies not only to the amount of fundamental investigation in animal nutrition, but to the character and progress of the ordinary experimental work. Not that there has not been an increase in the amount of advanced work, and an improvement in many of the common feeding experiments, but that relatively the improvement has been small. With the progress of experiment station work and the larger emphasis on investigation, it seemed reasonable to expect that more institutions should feel the need of departing from the conventional range of feeding experiments and more men representing animal husbandry at the stations should feel impelled to prepare for advanced and productive inquiry.

With some notable exceptions, the work in animal husbandry is to a considerable extent at a standstill. The easier things have been done. The more difficult and constructive stage has been reached, but there has not been a very large rising to the emergency. It is only rarely that a feeding project of Adams fund grade is submitted nowadays, but the experiments of conventional type go on apparently without end and, it is feared, without marking much permanent advance.

Quite a proportion of the feeding experiments still deal only with the economic and commercial phases of the subject, or with comparative values and effects; and as economic conditions are constantly changing and vary in different localities, the results lack

permanent or widely applicable value. Hence it is that the necessity is felt for going over much the same ground at frequent intervals and in different localities. And while this is not without value to the farmer it often represents an unnecessary waste of effort, and stands in the way of what might mark more real progress. Essentially the same kind of experiments are often repeated by stations in the same general locality, and with full knowledge of such repetition, as was the case a few years ago when silage was being tested for beef production. The result in such cases becomes largely a local demonstration rather than the acquisition of new information. In fact, the statement has often been made that the work was done to convince the farmers of the locality of the truthfulness or application of work in other States, the thought being that they had a different feeling if the experiments were made under their conditions.

There is undoubtedly much merit in the conventional feeding experiments and in experiments which interpret the best experience of the locality. But such experiments should profit by what has gone before, and should show improvement in method and in the extent to which the results contribute to a more complete understanding of the general subject. Manifestly the experimental results must be secured under such conditions as to insure accuracy and reliability within reasonable limits, and to make possible the comparison of the results with other experiments. At present there is the widest variation in experiments of this class. Between the feeding trial that deals only with the gross effect as measured by lots, and the more refined experiment which carefully guards and controls the conditions and results as applied to individual animals, and seeks the reason in the changes which actually take place, there is a wide gap. One is the rough comparison such as a feeder might make, if he had the time, and the other represents an attempt to trace the true relation between cause and effect.

It would seem that we should have largely passed the stage of the first type mentioned, but the publications and records of work in progress do not show this to be the case. Such trials, with all their crudeness, meet a popular demand and this demand is being acceded to despite the development of demonstration and extension work. Unfortunately there are some indications that the latter is already constituting a new demand for superficial work. This more direct teaching of the farmers brings out local problems in increasing numbers, and makes an urgent call for very practical and didactic directions which have behind them the force of local experimental trials.

But the experiment station can not afford to look at the subject of feeding from the superficial and local standpoint, and it is hardly its function to make experiments to demonstrate locally what is already known. Extension work will be an actual disadvantage to

experimentation if this requirement is pressed beyond reasonable bounds, and the extension worker must realize the need of thorough-going work.

A thorough understanding and sympathetic relation between the station men and the extension men is highly desirable. The latter coming in more direct contact with the farmers are in position to explain the station's work and to justify its position. They are also in position to call to the station's attention, in a discriminating way, larger questions in animal feeding which need study. But the extension men must be reasonable in their expectations of the stations, and they must also realize that after all the chief object of extension teaching is to enlighten the farmer and to help him in making himself more resourceful. Rules for farming to be followed blindly and implicitly can rarely be developed, and would be a serious detriment to the men engaged in the industry if they could be supplied; while carefully made and interpreted experiments can develop facts that will be of wide application, which may be tested out and adapted to the region. But the demonstration of such facts for the information or convincing of the farmers is a matter for the extension department. Such demonstrations will frequently embody some experimental features, since it is rarely possible to adapt locally the teachings of the stations without some special modifications which arise from local conditions. This is invariably the case in everyday life. Matters of convenience, expediency, personal preference, etc., modify human conduct. Similar considerations will inevitably modify the local practice in agriculture which the extension department will succeed in implanting.

The case of the usual feeding experiment is clearly and fairly set forth in the recent bulletin of Mitchell and Grindley of the Illinois Station. In reference to experiments comparing the fattening effect of systems of treatment, etc., the authors say: "Our knowledge of the principles of animal nutrition is too fragmentary to enable us to foretell with certainty, except when greatly dissimilar, which of two rations for instance will produce the more rapid or the more economical gains in weight for a particular kind of farm animal, no matter how clearly defined or completely analyzed the results may be. Actual experiment with those particular rations is generally essential to a satisfactory solution of the problem. However, the information thus obtained has at best a very limited application to other rations or other conditions, so that such feeding experiments ordinarily contribute little of fundamental importance to the science of animal nutrition."

Although the plan of such feeding experiments is simple, the results are often ambiguous and require much care in their interpreta-

tion. This is common to all experiments concerned with the functional activity of living organisms, and is due to the uncertainty of their following exact rules of uniformity, i. e., to what we designate as individuality.

Mitchell and Grindley have presented a most interesting and suggestive study on this element of uncertainty in the interpretation of feeding experiments. It is one of the most effective critical studies of any branch of our station work, and should be very helpful in directing attention to the improvement of experiments of this class and their interpretation. The bulletin illustrates not only the danger to be guarded against from a scientific standpoint, but to an even greater extent when deductions are to be made for the guidance of the farmer, because the latter often can not impose the precise experimental conditions required.

Manifestly experiments of this class are crude and hence lacking in absolute accuracy. This should be recognized to guard against overconfidence and too broad generalizations; and at the same time the effort should be put forth to improve the methods both in planning and execution. As a first step we need to know for our own information the extent of the experimental error and its source. Until we do know this the necessity of improvement is not apparent and its means is uncertain. Refinement of certain stages of the feeding may be more than counterbalanced by the inherent errors due to poor selection of animals or some other defect. The extent of the experimental error is an index to the degree to which deductions can be safely drawn, and will indicate caution in making broad generalizations for the benefit of the practical feeder.

The extensive review of experiment station literature in the United States made by Mitchell and Grindley develops the nature and the source of the experimental error and points to methods of reducing it. They find an average coefficient of variation in gain of about twenty-one per cent for similarly treated lots of sheep and of about seventeen per cent for steers and swine. This points to the danger of small lots of animals and of uneven selection of individuals. As the authors say, "increasing the size of lots is no remedy for a poor selection of experimental animals," and "can not eliminate individuality by merely reducing its effect on the average." Furthermore, "the necessity of selecting homogeneous lots of animals is not appreciably diminished by the balancing of heterogeneous lots."

The critical analysis represented by this bulletin points out the inherent weakness of such experiments, as commonly made, and the need of more scientific and dependable methods in our present feeding trials. They are not all that they should be or might be made, and they are not all that we have assumed them to be. Whether

or not the more abstract research in nutrition is entered upon, experiments for the benefit of practical feeding should carry all the conviction which accuracy of plan and method and judgment in interpretation can make possible.

Some improvement is to be noted in the feeding experiments of recent years, but it is doubtful whether an increasing proportion of such experiments are made under more exact and better-known conditions than formerly—whether the individual records are taken, the feed subjected to analysis, the limits of experimental error considered, and other refinements observed. Indeed, there seems in a considerable number of cases to be less regard for these factors than formerly.

Furthermore, there does not appear to be a very critical attitude toward these feeding experiments by many of the men who make and apply them—the animal husbandmen and animal feeders. The experiments are rarely weighed in the critical, discriminating manner that characterizes scientific work in general in the attempt to measure their true value and the advance which they mark. The expectations are less exacting, and the standard of requirements seems to change but little as time goes on. Apparently the need of a broader special preparation along scientific lines for experimental work in animal husbandry is not very generally felt, while the same importance as formerly is attached to the practical aspects of the subject, sometimes to the overshadowing of others. In other words, it would appear that the standards and ideals, and to some extent the preparation, for work in animal husbandry have not developed to the extent that they have in some other branches of agriculture, and that the setting off of the subject as a separate division and assignment of the feeding studies to it has not been followed by the general strengthening of the experimental work that is clearly desirable.

This is not said in any spirit of harsh criticism of the animal husbandman, or lack of appreciation of the requirements placed upon him. It is made rather as a comment on the condition and attitude which is believed to impede the progress in animal feeding, and is directed at the animal husbandman because he now has such an important relation to this progress. Not that he will necessarily be the one himself to conduct the research in a larger degree, but that as representing the head of animal husbandry work he must furnish much of the spirit and the encouragement and the defense for advanced study, and that his ideals will inevitably influence the character of the activities. If his attitude is not progressive and appreciative of work and methods which aim beyond economic considerations, such work will rarely flourish in his institution.

As a leader of sentiment in his field his influence as well as his actual direction of work is very broad. To him falls the application

and adaptation of the findings of experimental study and the presentation of them to the student and to the farmer. And on him rests in large degree the furnishing of the initiative.

Whether research flourishes or decays depends ultimately on the ideals and conceptions of the class it seeks to serve. If there is not a desire for it and an appreciation and belief in it which constitute a sustaining influence, it can not rise above the mediocre.

It is unreasonable to expect that the animal husbandman, more than the agronomist, will be alike investigator, teacher, and extension worker at the same time, but if he is to be assigned to the experiment station force he should be capable of taking an active and intelligent part in investigation. If he is to take a vital part, and not merely attend to the mechanical operations of feeding and handling the animals, it is not sufficient that his training should make him a good judge of stock and a successful feeder and breeder, but he must have an insight into the method and the spirit of inquiry, and familiarity with the progress of investigation in his field along the theoretical as well as the applied side. These things will require training in science beyond that given in the agricultural course. They mean special preparation for investigation and for its direction. Lack of training in animal physiology and other sciences which will open the way for broader inquiries will constitute a serious handicap to the animal husbandman as a station worker and necessarily impose limitations.

In the system of organization which is becoming common in our institutions, the animal husbandman may be called upon to outline and direct investigations within his department that involve the various branches of science concerned. Unless he is able to see the needs of such investigation, to suggest problems and points of attack and to make himself a part of the investigation, he will have only a passive relation to it and can hardly be expected to take a vital interest in it.

A well known investigator has said: "That researches directed to immediately practical results frequently fail to yield all that may be expected of them is largely due to the imperfections of the scientific work of the past, and so makes evident the importance of undertaking in the present purely scientific studies which will lead to more definite and valuable results when future experiments are directed to the solution of practical problems."

This is equivalent to saying that the practical efficiency of feeding trials depends on knowledge of the principles and scientific facts underlying nutrition. If our understanding of the principles of physiology and chemistry is deficient, it is impossible to account for or explain results secured in practical experiments, or to interpret

them intelligently—an experience which has not been unusual in the past. If, for example, in a practical feeding trial including equal amounts of protein materials from different sources different results are secured from those expected, we are thrown into confusion because having assumed all proteins to be alike we have no explanation to offer. The investigation of these bodies has made the experimental feeder more resourceful in planning and interpreting his work.

Dr. Armsby has well said: "If we believe at all in the utility of applied science, surely we must believe that a study of the intricate workings of the animal machine will yield results of practical value, even though we can not foresee in just what direction."

Animal feeding is by no means a matter of applied mathematics, as was long ago said, but there are certain physiological principles and laws which the animal body follows in the handling and utilization of food, and the knowledge of these must constitute the basis not only for the theory but for the right practice of feeding. It is reasonable to suppose that the necessity for investigation in this line should have impressed itself, and that there should have been a steady development in that direction, along with the experiments of more direct application.

It is clear, of course, that such questions as the maintenance requirements of animals, the interesting question of the influence of feed supply on growth, the protein requirements of farm animals, the functions of protein in the mechanism of the liberation of energy for work, can never be solved by the methods of the common feeding experiment. They call for all the resources of physiological investigation. They tax man's ability and ingenuity and perception to the utmost. The field offers all the inspiration of opportunity for the very best research ability. Some of these subjects and such questions as the constitution and nutritive value of proteins, the function and transformation of nucleo-proteins, and the metabolism of these and other bodies are being studied by physiologists and physiological chemists and not by the animal husbandmen. This is natural, and is immaterial as long as the latter take heed of the results of such work and apply them in their experiments and their teachings. It is not alone benevolent tolerance that is desired for such research, but intelligent and active support for it and a measure of participation in it by those who stand for animal husbandry.

The nature of the subjects which need to be studied and taken account of in their bearing on animal nutrition, and the trend of investigation under way, have been effectively set forth at several sessions of the Graduate School in a way to open up the broader relations of the subject, and also in the proceedings of the American Society of Animal Nutrition. Such study does not always require a

respiration calorimeter, although it calls for adequate laboratory equipment, and it is not necessarily beyond the means of an institution, although ordinarily expensive. Studies that would doubtless cost less than the customary feeding trials might well yield far more to enrich the body of established fact and make the next step possible. After all it is largely a matter of attitude and spirit, for with these the means will follow.

A by-product of nearly every serious investigation in feeding is a series of problems which are suggested as needing investigation. This is the experience of every keen investigator. He encounters questions which he needs light upon, and when he undertakes to search them out in the literature he finds they have not been solved—perhaps worked on fragmentarily by several men and then left in the doubtful stage, with an indeterminate degree of finality.

Many of the large questions in animal nutrition call for cooperation which will bring different branches of science to bear upon them. As President Waters has well said: "The animal husbandman must be content to share the plan, the work, and the credit with other departments of the station. The besetting sin of our present organization of the experiment station and the cause of much of our superficial work is the unwillingness or incapacity of our men to combine themselves into a team and attack a problem as an institution rather than as an individual or as one small department of the institution. . . . We constantly are seeking the lines of cleavage between departments of the station when we should be seeking the means of knitting them together into one whole. The latter is the modern practice of well-organized team work, the former ancient and inefficient individualism." The animal husbandry department furnishes the nucleus, and many will furnish the problems, around which such effective cooperation may be organized.

Cooperation among institutions working along a common line offers many opportunities for helpfulness. A plan for such cooperation was outlined by the Committee on Experiments of the American Society of Animal Nutrition several years ago, to include an investigation upon the optimum protein supply of fattening cattle and the digestibility of feeding stuffs with pigs. Thus far, aside from a passing interest of the members of the society, the results have been largely negative and the proposal has not met with the response that was hoped for. However, the committee reported at the last meeting of the society that it still believed the plan "will be of considerable service to experiment station workers in their attempts to solve some of the problems of animal nutrition." It deserves to be tried. The accumulation of a body of comparable data secured in accordance with a common plan and purpose would be an important step and would mean far more than separate, inde-

pendent experiments which embody nothing in common and are incapable of comparison or combination.

The importance of the subject of animal feeding merits the very best effort which the experiment stations are capable of commanding. The conventional experiments have served a very useful purpose and will continue to be needed, but they should be refined to give a greater degree of accuracy and should be subjected to more critical examination in their planning and their conduct. But beyond this, one of the ultimate objects of work in this field, as in every other, must be to make practice more intelligent and better understood. This calls for the determination of the reason for what is found in experiment and observed in good practice. Without this the theory of feeding can not be developed and the more practical experiments can not reach their highest degree of reliability or usefulness.

One of the greatest needs is more men of training who can see the field in its broader aspects and develop a point of attack. Especially, there should be no question of the encouragement and defense of the higher types of work by the men in charge of animal husbandry in the agricultural colleges and experiment stations.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

In regard to the constitution of albumin, R. CHODAT (*Abs. in Chem. Ztg.*, 36 (1912), No. 52, p. 487).—A special reaction is described which is supposed to be characteristic of the α -aminocarboxylic acids of the fatty series, peptids, simple or complex peptid chains, polypeptids, peptones, albumoses, and soluble proteins. The method is as follows: A purified tyrosinase is allowed to act upon a phenol; i. e., p-cresol, pyrocatechol, etc., in the presence of equimolecular or multiple quantities of an amino acid, a peptid, or a polypeptid. The reaction is indicated by a red coloration which changes to a violet green and finally to a blue having marked red dichroisms, and is very sensitive.

The following among other substances were studied: Glycocoll, d- and l-alanin, d-valin, d- and l-leucin, phenylglycin, d- and l-tyrosin, d- and l-phenyl-alanin, arginin, and cystin. Anthranilis acid does not react, but with tryptophan and pyrrolidincarboxylic acid a stronger coloration is obtained. Peptones and albumoses give a marked coloration which becomes stronger as peptonization proceeds. The color is also marked in the case of albumins, pure globulins, nucleo-globulins, and other proteins. The reaction will also show a change in the condensation or alteration in the composition of the original protein. As the reaction is specific for amino acids, it determines without going any further the presence of NH_2 - and COOH -groups.

A preliminary note on the coagulation of proteins by ultraviolet light, W. T. BOVIE (*Science*, n. ser., 37 (1913), No. 940, pp. 24, 25).—In order to gain insight into the action of ultraviolet light on living cells, tests were conducted with ordinary egg albumin, crystallized egg albumin prepared according to the Hopkins and Pinkus method, egg albumin (Hopkins and Pinkus) dialyzed against tap water, and ox serum.

In all instances the albumin was more or less coagulated, and in the case of the egg albumins the coagulum produced was insoluble in alcohol, hot or cold water, and dilute acids, but soluble in dilute alkalis. In these respects it corresponded to the coagulum produced by heat alone.

New investigations in regard to our knowledge of fats, R. LIMPRICH (*Neue Untersuchungen zur Kenntnis der Fette. Inaug. Diss., Univ. Münster, 1912, pp. 89, figs. 9*).—The first part of this work embraces a study of methods for determining the presence of beef or mutton tallow in lard. It describes a new method for this purpose, and gives the results of a study of the Polenske method and its theoretical foundations.

The second part deals with heptadecylic acid and triheptadecylene, the former having been previously found by other investigators to be present in lard in the form of a glycerid. An attempt was made to prepare the heptadecylic acid synthetically and to compare it with the compound occurring in lard.

The third part of the dissertation gives the results of some feeding experiments with carp, with special reference to the influence of the fat given in the food on the body fat of the animals.

Reducing power of sugars (monosaccharids), and its bearing on the definition of these substances, N. SCHOORL (*Chem. Weekbl.*, 9 (1912), No. 35, pp. 706-711; *abs. in Jour. Chem. Soc. [London]*, 102 (1912), No. 600, I, p. 750).—The introduction of a nonoxidized carbon atom between the CO- and CH(OH)-groups in a compound containing the group .CO.CH(OH). diminishes the reducing power materially toward weak alkaline copper solutions. The author maintains that the term "sugar" should include all substances containing the group .CO.CH(OH)., whether they are polyhydric alcohols or not.

Studies in regard to plant colloids.—I, Swelling of the starch solution in the presence of crystalloids, M. SAMEC (*Kolloidchem. Beihefte*, 3 (1911), No. 3-4, pp. 123-160, figs. 7).—The presence of a crystalloid seems to change the swelling of starch granules in lower concentration than was usually supposed. This is apparently due to the anions, and the cations have only a quantitative influence upon the action exerted by the anions. The influence of the inorganic and organic crystalloids, glucose, urea, chloral hydrate, glycerin, etc., upon the swelling process of starch and gelatin with few exceptions is identical.

The stimulation of swelling for the ions investigated is a periodic function of the atomic weight of the respective element. Classification according to the nature and intensity of the swelling process leads to the figures obtained by Pauli and Hofmeister. The swelling induced by certain salts was found to be reversed with an increase in temperature. Salts yielding OH on cleavage in medium concentrations seem to induce swelling.

Acids do not show as great a sensitiveness toward starch as salts. The same conditions for swelling hold for acids as for salts, and, in addition, the condition of the solution (solvate) is modified by the respective acid. Bases stimulate the swelling in highly dilute solutions, and in the lowest concentrations alkali hydroxids show the greatest influence in this direction. The curve (swelling) of most salts points to the formation of ion-adsorption compounds with starch, while the swelling produced by alkali hydroxids can be explained in the light of Pauli's theory of ion hydration. The influence which other crystalloids exert upon starch appears also to be due to lyotrop activities.

On the starch of glutinous rice and its hydrolysis by diastase, Y. TANAKA (*Jour. Indus. and Engin. Chem.*, 4 (1912), No. 12, p. 918).—This presents corrections of an article previously noted (*E. S. R.*, 28, p. 407).

Investigations in regard to the formation of enzymes.—VII, About the development of certain yeasts in various nutrient solutions, H. EULER and B. PALM (*Hoppe-Seyler's Ztschr. Physiol. Chem.*, 81 (1912), No. 1-2, pp. 59-70, figs. 6).—The results show that the quantitative multiplication of cells of *Saccharomyces cerevisiae* (beer yeast), *S. apiculatus*, and *S. marxianus* in a solution of an unfermentable disaccharid and fermentable hexose proceeds in the same manner. Apparently yeasts contain hydrolyzing enzymes for certain disaccharids, the fermentation of which can not be determined by existing methods.

The nutrient solution in addition to the sugar was composed of 0.25 gm. of magnesium sulphate, 5 gm. of orthomonopotassium sulphate, and 4.5 gm. of asparagin and water to make 1 liter. The sugars studied were saccharose, glucose, galactose, and lactose.

S. thermantitonus was also tested in this regard but with negative results.

Formation of alkali by enzymes, C. NEUBERG (*Abs. in Zentbl. Physiol.*, 26 (1912), No. 16, pp. 715-717).—The fermentation of the potassium salt of pyroracemic acid with yeast or yeast juice, prepared by von Lebedew's methods, resulted in the formation of carbon dioxid acetaldehyde and potassium car-

bonate. The same fermentation can be produced with the potassium salt of oxalacetic acid.

The biological analysis of casein antiserum, A. KLEIN (*Folia Microbiol. [Delft]*, 1 (1912), No. 1-2, pp. 101-162, table 1; *abs. in Milchw. Zentbl.*, 41 (1912), No. 23, pp. 720, 721).—The antiserum used in these investigations was prepared by injecting casein solutions into rabbits. It was invariably found that 2 kinds of precipitins were produced, which had the following distinguishing features:

Calcium casein precipitin acts exclusively in the presence of calcium chlorid with an optimum activity at a concentration of 5 parts per thousand. Casein precipitation is the most complete when calcium chlorid is absent, and the precipitation decreases as the calcium chlorid increases. Calcium casein precipitin shows an optimum activity with 2 mg. of casein, and casein precipitin with 0.1 mg. of casein. Both of the precipitins are weakened by diluting the serum with physiological salt solution, or by adding an alkali, but casein precipitin is the more affected. The addition of water to fresh antisera produces a precipitate in casein sera, but not in calcium casein sera. As the antisera grow older, or are heated to 55° C., casein precipitin loses some of its precipitating capacity; no such effect is noted with calcium casein precipitin. In the process of immunizing, calcium casein precipitin first makes its appearance in the sera. The calcium casein precipitation reaction obtained with the casein antisera and lactosera does not detect more than $\pm 1/30$ mg. of casein. Casein precipitins do not detect more than 1/100 mg. casein, and in this respect resemble glycerine-acetic acid. Casein precipitin also inhibits the action of calcium casein antiserum.

Some applications of lacto- and ovosera, B. GALLI-VALERIO and M. BORNAND (*Ztschr. Immunitätsf. u. Expt. Ther.*, I, Orig., 14 (1912), No. 1, pp. 32-41, fig. 1; *abs. in Centbl. Bakt. [etc.]*, 1. Abt., Ref., 55 (1912), No. 8, p. 233).—With a lactoantiserum it was possible to detect casein, particularly in feces and in fats. Likewise it was possible with a fowl antiserum to detect eggs in various foodstuffs.

A contribution to our methods of determining nitrogen in humus, C. B. LIPMAN and H. F. PRESSEY (*Jour. Indus. and Engin. Chem.*, 5 (1913), No. 2, pp. 143, 144).—While much work has been done in regard to methods for determining humus in soils, very little appears to have been reported with reference to the determination of nitrogen in the humus. To obtain a more uniform and reliable method for determining nitrogen, the Wilfarth, Gunning-Atterberg, Hibbard, and salicylic acid methods were compared. The soils from which the humus solutions were obtained included light sandy soil from a walnut orchard, Anaheim, Cal., with a humus content of 0.55 per cent; silty clay loam derived from the State of Washington, humus content 8.89 per cent; and tule soil from an island in the Sacramento River, nearly all organic matter, humus content 28.7 per cent.

The Hibbard method gave the highest amounts of nitrogen in all cases except one, thus showing a more thorough digestion, and its duplicate and triplicate determinations showed the best agreement. The digestion was carried out more rapidly than in any other method, and particularly than by the salicylic acid method which, in other respects, came the nearest to the Hibbard method in yielding satisfactory results. Considerable trouble with bumping was experienced with all methods except the Hibbard, in which the digestion proceeded rapidly and quietly in all cases. Its manipulation also surpassed in simplicity and speed all the other methods tested. "In view of the fact, therefore, that the Hibbard method is far superior to the others so far as both accuracy and speed are concerned, its use is urged in all humus nitrogen determinations."

A comparison of some qualitative and quantitative methods for carbonates in soils, E. W. GAITHER (*Jour. Indus. and Engin. Chem.*, 5 (1913), No. 2, pp. 138-143, figs. 4).—The author finds that methods which boil soils with mineral acids at 100° C. for determining the carbon dioxid content of the soils are inaccurate as a measure for carbonates in soils, because often the organic matter present in the soil is decomposed by the acid treatment, and results in the evolution of carbon dioxid. This confirms the findings of Marr (E. S. R., 22, p. 511). If, however, the soils are boiled in a partial vacuum at 50° with dilute mineral acids, no decomposition of organic matter takes place, and the evolved carbon dioxid is representative of the carbonates present.

The litmus paper test, when properly conducted, was found to be the best qualitative test known for determining the presence of native carbonates in soils from humid regions. On the other hand, some soils may give an alkaline reaction not due to carbonate but to the products resulting from the hydrolysis of certain minerals which exist in soils, as pointed out by Cameron and Bell (E. S. R., 17, p. 742). Although the reddening of blue litmus paper may be due to the absorption of the base from hydrolyzed litmus salt, the presence of native carbonates in soils can either prevent this selective absorption, or it may cause an interchange of bases to take place. If a native carbonate, which is capable of being decomposed by weak hydrochloric acid at a low temperature, is present in the soil, it is indicated by the bluing of red litmus paper. If no alkalis or basic materials are present which yield alkaline solutions, a reaction is obtained with blue litmus paper.

Soils containing substances which redden blue litmus paper have a tendency to the formation of acids or acid salts, which unite with the base absorbed from hydrolyzed litmus and fail to return another base in its stead. This results in the reddening of the indicator even though no hydrogen ions are yielded to a water solution. It is possible that the soil is capable of producing a physiological action which is similar to that produced by stronger acids yielding hydrogen ions to aqueous solutions.

Polarization before inversion in the examination of molasses by Clerget's method, J. J. HAZEWINKEL and C. LOURENS (*Meded. Proefstat. Java-Suiker-indus.*, 1912, No. 21, pp. 635-637; *Arch. Suikerindus. Nederland. Indië*, 20 (1912), No. 27, pp. 1073-1075).—The method recommended is as follows: One-half of the normal weight of the molasses is taken in a 100 cc. flask; then 10 cc. of a solution of neutral lead acetate is added, filled up to the mark with water, from 3 to 5 gm. of bone black added, shaken, and filtered. The polarization is done in a 200 or 400 mm. tube.

The freezing point of milk, J. B. HENDERSON and L. A. MESTON (*Proc. Roy. Soc. Queensland*, 24 (1913), pp. 165-180, pl. 1).—With a view to determining a reliable method by which the addition of water to milk could be detected, tests were made of the freezing point of milk under a variety of conditions. Results indicated "(1) that the freezing point of pure fresh milk samples from herds of cows in southern Queensland never shows a greater variation than from 0.55° to 0.56° C., the mean being 0.555° (this is exactly in accord with Continental experience); and (2) that the freezing point determines with accuracy the proportion of water added to any milk from a herd, and distinguishes with absolute certainty the watered rich milk from the naturally poor milk."

A new scale for determining moisture in butter, E. WÖRNER (*Ztschr. Untersuch. Nahr. u. Genussmtl.*, 24 (1912), No. 12, pp. 741, 742, fig. 1).—A description and illustration of the apparatus are given.

A simple test for the determination of butter fat in butter, J. M. DORAN (*Jour. Indus. and Engin. Chem.*, 4 (1912), No. 11, pp. 841, 842, fig. 1).—The method, which simply serves as a control test for the chemical method, is con-

ducted as follows: "The sample of butter, taken with a trier or otherwise, is first warmed to about 100° F. and thoroughly stirred to insure the mass being uniform. About 10 cc. of the sample is placed in a sedimentation tube and whirled in a [hand] centrifuge for a few seconds. The sample should be sufficiently liquid in order to insure a good reading after being whirled in the centrifuge. After reading the amount of the sample on the tube scale, about 5 cc. of gasoline is added and the tube carefully inverted 2 or 3 times, holding the thumb or finger over the top of the tube. Let the solution of fat and gasoline drain a few seconds before removing the finger. Place the tube in the centrifuge and whirl again for 15 or 20 seconds.

"The gasoline dissolves the fat, forming a clear layer on the top. The non-fats, that is the water, salt, and curd, being immiscible with the gasoline and also heavier, form the lower layer. The second whirling drives the nonfats to the lower end of the tube almost completely, at the same time forming a sharp line of division between the 2 layers. The amount of nonfats is then carefully read on the tube scale. . . .

"Care should be taken that this test is made at a fairly uniform temperature in order to eliminate as far as possible the changes in relative volumes due to variations in temperature. In case the sample when first placed in the sedimentation tube is not sufficiently liquid to insure a good reading on being whirled, it may be warmed by placing it in water or in an oven for a few minutes at a temperature not over 110°."

The method yields slightly higher results than the official method.

A simplification of the method for determining the Reichert-Meissl and Polenske numbers, A. GOSKE (*Ztschr. Untersuch. Nahr. u. Genussmitl.*, 24 (1912), No. 4, pp. 274-276, fig. 1).—The apparatus consists of a boiling flask, a distilling tube (1 bulb), a Liebig condenser with a flared upper end, a funnel, holding a piece of filter paper, attached with a cork to the lower end of the Liebig condenser, and a 110 cc. receiving flask divided into 10 cc. divisions. The advantages claimed for this apparatus are that (1) filtration after distillation is unnecessary; (2) titration is done directly in the 110 cc. obtained; (3) rinsing of the apparatus is eliminated, and in this way the losses observed in the usual procedure are avoided; and (4) no special preparation of the filter is necessary for the second determination.

Estimation of essential oil in mustard, D. RAQUET (*Ann. Chim. Analyt.*, 17 (1912), No. 5, pp. 174-178; *abs. in Analyst*, 37 (1912), No. 436, p. 309).—It is pointed out that mixing mustard with water previous to distillation and allowing it to stand for some time is often followed by inconcordant results. Micro-organisms develop and exert their activity under these conditions, which results in the loss of oil. "If, however, dilute alcohol be used in place of water, the digestion may be allowed to proceed for even 24 hours without loss of essential oil. Having regard to these conditions, the following method is recommended for the estimation of the oil:

"Five gm. of the mustard flour is mixed in a 250 cc. flask with 100 cc. of water and 20 cc. of 90 per cent alcohol; the flask is now closed and set aside for 6 hours, or heated to a temperature of 35° C. for 1 hour. The contents are then distilled, and 50 cc. of the distillate is collected in a 100 cc. flask in which 10 cc. of ammonia have been placed previously; 20 cc. of tenth-normal silver nitrate solution is now added, the distillation is continued until the 100 cc. flask is filled nearly to the mark, and after the flask has been closed with a stopper carrying a long glass tube, the contents are heated to 85° for 1 hour. When cold, the mixture is diluted to 100 cc., filtered, and the excess of silver is titrated in 50 cc. of the filtrate by means of tenth-normal thiocyanate solution after the addition of nitric acid. The number of cubic centimeters of

tenth-normal silver nitrate used is multiplied by 0.198 to obtain the weight of allyl thiocarbimid in 100 gm. of the mustard. The following percentage quantities of mustard oil (as allyl thiocarbimid) were found in samples of black mustard of different origin: English, 1.39, Greek 1.20, French 1.08, Sicilian 0.99, Italian 0.99, and Bombay 0.81 per cent."

Official methods of analysis adopted by the Texas Cotton Seed Crushers' Association (*Oil, Paint and Drug Reporter*, 82 (1912), No. 6, p. 32c).—The methods are for moisture, oil, ammonia and protein nitrogen, total fatty acids, and refinery losses.

Method for determining the amount of cotton-seed hulls in cotton-seed meal, C. J. KOLE (*Verslag. Landbouwk. Onderzoek. Rijkslandbouwproefstat. [Netherlands]*, 1912, No. 12, pp. 34-47).—It is not deemed possible to obtain a good separation of hulls and meal body by sifting. Determining the crude fiber may give a clew as to whether a large or a small amount of hulls is present in the meal, but the results obtained are not accurate.

The National Experiment and Seed Control Station of Holland, located at Wageningen, uses the following method: Five gm. of the sample is treated in a cylinder with 300 cc. of boiling water and allowed to stand for at least 4 hours. The supernatant fluid is then poured off, and the residue is brought upon a piece of gauze (15 by 15 cm., mesh 10 microns) with the aid of a stream of water. The 4 ends of the gauze are brought together and the mass kneaded with the fingers for the purpose of reducing its size. The mass is then washed back into the cylinder, and when the hulls have sunk the fluid containing the floating particles of meal body is poured off. The cylinder is filled again with water, and when the coarse particles of hull have subsided, the supernatant fluid containing the fine particles of shell and coarse particles of meal is transferred to the gauze. The mass is then rubbed up in a mortar and transferred again to the cylinder. These processes are repeated until all meal body has been removed, when the residue, representing the hulls, is dried. The weight of these hulls is multiplied by an empirical factor $100 \div 72$, which gives the amount of hulls present in the sample.

It is stated that cotton-seed meal commonly contains about 15 per cent of hulls.

The determination of formaldehyde, E. RIMINI and T. JONA (*Gior. Farm. e Chim.*, 61 (1912), No. 2, pp. 49-56; *abs. in Chem. Ztg.*, 36 (1912), No. 87, *Repert.*, p. 401; *Chem. Zentbl.*, 1912, I, No. 14, p. 1147).—Riegler's method, based on the conversion of formaldehyde into formalazin by the addition of a known amount of hydrazin, decomposing the excess of the latter with iodic acid and measuring the resulting nitrogen, is deemed inaccurate because formalazin is also decomposed in an acid solution. Consequently the author decomposes the hydrazin in an alkaline solution in which formalazin is perfectly stable. Potassium iodate can not be used instead of iodic acid.

Extraction of oil by aspiration, J. CHAPELLE and J. RUBY (*Jour. Agr. Prat.*, n. ser., 24 (1912), Nos. 48, pp. 686-688, figs. 2; 49, pp. 719-721, fig. 1).—A detailed description of a method for depriving olives of their oil by aspiration. The machinery required is illustrated.

The effect of kiln drying at 145° F. on the composition of the hop, H. V. TARTAR and B. PILKINGTON (*Jour. Indus. and Engin. Chem.*, 4 (1912), No. 11, pp. 839, 840).—The proper temperature to be used in the kiln drying of hops still being a question in dispute, the authors were prompted to repeat in a limited way some of the work which has been reported by other investigators. For this test 7 samples of Pacific coast hops were used. The temperature used in kiln drying in each instance varied between 120° and 145° F., the latter being the one which is preferred at the present time by Oregon hop growers. "The

drying was begun at the lower temperature and then gradually raised to 145°, at which temperature it was held as nearly as possible until the hops were dried. The temperature was taken with thermometers which were kept just under the floor of the kiln and at that portion of the kiln where the temperature was highest." The kilns employed were, with one exception, ordinary stove kilns, and were representative of those in common use. Comparisons were made with samples of hops which were air dried at room temperature. The determinations made were water, total resins, hard (gamma) resin, beta resin, alpha resin, tannin, and wax.

"The results indicate that there was little if any change in the composition of the hops during the kiln-drying process. It will be noted that [with the exception of 2] samples, the amount of hard resin is slightly greater in the air-dried samples, a result which may be due to the variation in different samples. There was evidently little if any change in the amounts of tannin and wax, considering the possible variation in separate samples. A physical examination showed that the difference in the aroma of the air-dried and the kiln-dried samples was hardly perceptible, different judges varying somewhat in their opinions."

See also previous work (E. S. R., 27, p. 814).

Notes on expressed and distilled West Indian lime oils, H. A. TEMPANY and N. GREENHALGH (*West Indian Bul.*, 12 (1912), No. 4, pp. 498-503).—This gives the results of examining 7 samples of hand-expressed oils and 3 of distilled oils, in which were determined the specific gravity at 30° C., the optical rotation in a 100-mm. tube at 31°, the refractive index at 32°, the citral content by Burgess and Child's method, and the acid value by titration of 5 cc. of the oil dissolved in alcohol with seminormal alcoholic potash in the cold.

In regard to the expressed oils, the results show a somewhat wider divergence between the character of the different oils than is indicated by various authorities. The values for the optical rotation are lower than would be expected, probably because of the expansion of the oil owing to the high temperature at which measurements were made. The citral content and the acid number showed a fairly close correlation but varied markedly in different samples. The citral determination seemed to give satisfactory results. The amount of citral found varied markedly in the different samples, but was lower than is found in lemon oils, which, according to Gildemeister and Hoffman, contain from 7 to 10 per cent of that constituent.

With regard to distilled oils, the samples appeared to be characterized, on the whole, by a lower refractive index, citral content, and acid number, and in some cases a lower specific gravity. The rotation, on the other hand, was in all cases somewhat higher.

"From the above results, it would appear that during the process of distillation with steam (the conditions under which ordinary distilled oil is obtained being practically those of a steam distillation) a certain proportion of the lower and higher boiling constituents are removed. The blue fluorescence due to the presence of a crystalline substance in the higher fractions of the expressed oil is entirely absent in those of the distilled oils. This substance possibly may be the anthranilate which is known to exist in lime oil (Allen), to the methyl ester of which, $C_6H_4(NH.CH_3).COOCH_3$, E. J. Parry^a ascribes the blue fluorescence of mandarin orange oil. This is probably removed during the steam distillation.

"Expressed oil on standing generally deposits a pale yellow crystalline substance known as limettin. Distilled oils do not deposit this body. Limettin is

^a Allen's Organic Analysis, 2 (1907), pt. 3, p. 40.

stated to be dimethoxycoumarin; it is readily soluble in hot water, and it is possible that distillation with steam effects the removal of the limettin itself, or of that constituent of expressed oils which by the action of light may be converted into limettin. (A sample of limettin recrystallized from boiling water was found to have a melting point of 115°)."

Investigations on the extraction of lime juice by milling, H. A. TEMPANY and V. M. WEIL (*West Indian Bul.*, 12 (1912), No. 4, pp. 473-478).—The problems connected with the extraction of lime juice as practised in the West Indies at the present time are in many ways not dissimilar from those encountered in obtaining the juice from the sugar cane. In fact, in many cases old cane mills have been adapted to the purpose of expressing lime juice, and so far as the actual extraction is concerned, the processes in the case of the 2 industries are identical. The efficiency of the mill is computed, as a rule, from the number of gallons of juice obtained from 1 bbl. of limes, but as the size of the barrels and limes, and the juice content of the limes was believed to vary, a test was made with a number of samples of limes from various localities.

"An examination of these results shows that the average weight and volume of a single fruit, as also the acidity of the juice, vary largely according to the locality in which the fruit is grown, the former characteristics varying directly and the latter inversely with the rainfall at the place of origin. The percentage of juice contained in the fruit, however, varies relatively little, amounting approximately to 62 per cent of the total weight of the fruit. This result is of a distinctly unexpected character, since comparison with the sugar cane would tend to the belief that the juice content would be materially less in dry localities. It follows from this that measurement of the extraction of juice, if accurately performed, will afford a reliable criterion of the efficacy of the milling in lime juice works."

Some tests in regard to the residue of juice left in the pressed skins were made, and showed that this was almost a complete check upon the efficiency of milling at the time the sample was taken.

Experiments in lime juice concentration, J. C. MACINTYRE (*West Indian Bul.*, 12 (1912), No. 4, pp. 465-472).—"The experiments in lime juice concentration which are described were carried out for the purpose of ascertaining the loss of acid occurring at various degrees of concentration so as to be in a position to judge whether the cost of steam-jacketed pans or other plant would be justified, and incidentally, to determine the point to which it is most economical to concentrate." A note by F. Watts is appended to this paper pointing out the practical value of the results obtained.

Index to *Zeitschrift für Analytische Chemie*, H. FRESSENIUS and A. CZAPSKI (*Zeitschrift für Analytische Chemie, Autoren- und Sach-Register zu den Bänden 41-50*. Wiesbaden, 1912, pp. 287).—An author and subject index of volumes 41 to 50, issued from 1902 to 1911, is given.

METEOROLOGY—WATER.

Temperature coefficients in plant geography and climatology, B. E. and GRACE J. LIVINGSTON (*Bot. Gaz.*, 56 (1913), No. 5, pp. 349-375, figs. 3).—This paper deals fully with a subject which has been briefly discussed elsewhere (E. S. R., 28, p. 212; 29, p. 719). The direct temperature summations and summations of temperature efficiencies are charted and compared.

"For each of the direct summations, the normal daily mean minus 39, for the date next following the average date of the last frost in spring, is taken as the first term. To this are added the normal daily means, each decreased by 39, for all dates up to and including the average date of the last frost in autumn. . . .

For the summations of temperature efficiencies, the normal daily efficiencies corresponding, respectively, to the normal daily means of Bigelow's tables have simply been added for the same days as in the direct summations, thus giving what may be termed a tentative index of temperature efficiency for growth during the normal frostless season."

The general conclusions reached are that "the method of direct temperature summations has proved itself to give, in a broadly general way and for most of the area of the United States, nearly the same climatic zones as does [the] method of efficiency summations. . . . The similarity between the results derived by these two methods of temperature integration, however, is only superficial and roughly approximate. The ratios of direct summation to efficiency summation range in magnitude, for the mean frostless season in the United States, from a minimum of 7.49 to a maximum of 10.44. A rational and consistent climatic chart represents the geographical distribution of these ratio values; on such a chart the marginal regions of the country are frequently characterized by low ratios and the two main mountain systems appear to control areas of high values. There seems to be no doubt that the ratio here brought forward quantitatively represents a climatic dimension or characteristic, which appears to be some sort of function of the daily normal temperatures upon which this whole study has been based and of the time distribution of these temperature data within the period of the mean frostless season."

British rainfall, 1912, H. R. MILL and C. SALTER (*London, 1913, pp. 372, pls. 4, figs. 87*).—This report summarizes observations at 5,272 stations in Great Britain and Ireland grouped by counties and river basins.

The mean rainfall during the year was 39.31 in., 23 per cent above the average for 35 years (1875-1909), for England; 56.19 in., 19 per cent above the average, for Wales; 49.01 in., 11 per cent above the average, for Scotland; and 44.06 in., 8 per cent above the average, for Ireland. Within the last 32 years for which comparisons are available, two only (1882 and 1903) have been wetter than 1912 in the British Isles.

The report contains special articles on the great rain storm of August 25-26, 1912; the wettest summer in England and Wales; and the "Seathwaite" pattern rain gage.

Evaporation from a plain water surface, J. W. LEATHER (*Mem. Dept. Agr. India, Chem. Ser., 3 (1913), No. 1, pp. 15, pl. 1, figs. 2; abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 4 (1912), No. 8, pp. 1186, 1187*).—A description is given of the evaporimeter in use at Pusa, which consists essentially of a circular cement tank 6½ ft. in diameter and 5 ft. deep, with an adjustable pointer for measuring the water level. Records for 1911 and 1912 are tabulated and compared with other data obtained from the observatories at Madras and Lyallpur.

The rate of evaporation during the cold weather months was much the same at Pusa and at Lyallpur but was much higher at Lyallpur throughout the six hot months from May to October. At Pusa during the hottest months the rate of evaporation was three times that of the coldest months, at Lyallpur five times, and at Madras not quite twice that of the coldest months.

Dew ponds and mist ponds, E. A. MARTIN (*Rpt. Brit. Assoc. Adv. Sci., 1912, pp. 530, 531*).—An attempt is made in this article to explain the accumulation of water in these ponds. "The precipitation of mist into ponds, aided perhaps by silent discharges of electricity, and the entanglement of mist-laden salt dust in the hollows in which the ponds lie, are believed to be the means by which some ponds maintain a supply of water all through the year, in spite of the great draft which is made upon them by numerous cattle."

The artesian water supply of eastern and southern Florida, E. H. SELARDS and H. GUNTER (*Fla. Geol. Survey Ann. Rpt.*, 5 (1912), pp. 97-290, pls. 5, figs. 17).—This paper, which is the fourth of a series (E. S. R., 29, p. 315), includes a reprint of a paper on the water supply of eastern Florida (E. S. R., 25, p. 18), revised to include a report on the water supply of southern Florida. In the combined reports the artesian water supply is discussed in detail for each county lying in a section bordering the Atlantic and Gulf coasts, and comprising the principal artesian areas of Peninsular Florida.

Report of the interstate conference on artesian water, Sydney, 1912 (*Rpt. Interstate Conf. Artesian Water [Aust.]*, 1912, pp. XV+207+68, pls. 42).—The proceedings of this conference are reported. They dealt chiefly with the extent, methods of obtaining, and utilization of artesian waters for agricultural and other purposes in New South Wales. A number of maps, plates, and other data accompany the report.

SOILS—FERTILIZERS.

Soil, soil investigation, and soil valuation, F. PILZ (*Monatsh. Landw.*, 6 (1913), No. 10, pp. 298-309).—The author reviews the physics and chemistry of soils and soil structure with special reference to the question of fertilization and the use of soil analysis in estimating the value of the soil for cropping purposes. He demonstrates that the kind, amount, and success of fertilization depend on the crop, the fertilizer content of the soil, the physical condition of the soil and subsoil, and other factors, such as climate, cultivation, etc., and points out that to the average farmer a chemical analysis of his soil means practically nothing. He suggests the need of keeping accurate records in each rural district of the physical and chemical conditions of the soils of each farm and of the other local factors affecting crops in order that each farmer may obtain definite and accurate information regarding the necessary mechanical and chemical treatment of his particular soil.

Chemistry, physics, biology, and cultivation of the soil, M. HOFFMANN (*Jahresber. Landw.*, 27 (1912), pp. 24-60).—Recent reports of investigations on this subject are classified and reviewed as usual.

Contribution to the study of the soils of the Republic of Argentina, P. LAVENIR (*An. Min. Agr. Argentina, Secc. Quim.*, 2 (1912), No. 2, pp. 577, figs. 6).—This article describes methods of soil sampling, mechanical, physical, and chemical analysis, and the methods of soil classification employed by the chemical laboratory of the department of agriculture of Argentina, and draws conclusions regarding the practical interpretation and application of the results of analysis. Analyses are reported of a large number of samples of representative agricultural soils from the different Provinces of Argentina, most of which show conditions very favorable to agriculture.

Soil culture in Iceland, P. M. GRUNER (*Arch. Biontol*, 3 (1912), No. 2, pp. VI+213, pls. 2, figs. 28).—This work reviews the natural history of Iceland in its relation to the formation of swamps and describes the swamps from the standpoint of their value as sources of peat fuel and as meadow lands. In addition there is a somewhat lengthy discussion of garden cultivation as practiced in Iceland, including descriptions of soils, fertilizers, crops, climate, and other factors closely related to this work.

The results of mixed cultivation with loam in Finland, A. RINDELL (*Jahrb. Moork.*, 1 (1912), pp. 19-34).—A number of experiments were made in drained and burnt over peat swamps to determine the beneficial effect of adding different amounts of loam supplemented by phosphoric acid, potash, and lime as fertilizers.

The yield of grain was found to increase with increased loam addition. Fertilization with a mixture of phosphoric acid and potash further increased the yield, and somewhat more than fertilization with phosphoric acid alone, but with increasing loam treatment the difference in yields brought about by the two fertilizers steadily decreased. When practically the same experiments were made using sand instead of loam, the same general results were obtained except that the yields of grain were not nearly so large. The addition of lime showed little or no beneficial effect except where iron sulphid was present in the loam.

Comparative tests of lime and loam treatment of peat soils favored the loam, although the crop yield increased as the application of lime increased up to 2,670 lbs. per acre. It was found that repeated burning in case of certain peat swamps so reduced the nitrogen content that the crop yield was considerably lowered, making the addition of nitrogenous matter necessary.

The heat conductivity of damp sand and loam was found to be three or four times that of the peat. It was also found that loam treatment of peat soils sufficiently arrested frost action to allow plant life to exist in much colder weather. This is attributed to the better physical condition of the soil.

Moor culture, A. KOSTLAN (*Jahresber. Landw.*, 27 (1912), pp. 200-215, fig. 1).—Reports of recent investigations on this subject are classified and reviewed.

The shrinking of swamp soils resulting from drainage and cultivation, B. TACKE (*Jahrb. Moork.*, 1 (1912), pp. 35-45, pl. 1).—Attention is called to the marked shrinking and sinking of swamp soils resulting from drainage and other improvements. A sinking of from 15 to 25 per cent of the soil depth has been found to take place within 15 years after drainage in many swamps, especially in those from which the peat has been stripped. The shrinking and sinking occur in layers and not as a solid mass.

The degree to which drainage so affects the soil is said to depend chiefly on the physical and chemical composition and depth of the soil, on the amount and depth of drainage, and on the character and condition of the subsoil. In some upland swamps which are drained and stripped of peat the bed soil sinks below the water level in the drainage ditches. To obviate this it is suggested that in stripping the peat a bed be left somewhat more than 50 cm. above mean water level in the ditches and this be mixed with sand to reduce the shrinkage. Cultivation of peat stripped soil reduces the shrinkage more than the sand treatment, but the productivity is said to be not nearly so great. The effect of drainage on such soils can best be determined by observing the relative movements of the layers and comparing their densities as determined before and at intervals after drainage.

Investigations on the influence of plant roots on the structure of the soil, M. BERKMANN (*Internat. Mitt. Bodenk.*, 3 (1913), No. 1, pp. 1-49, figs. 6).—A series of pot experiments with two representative soils, one a sandy soil containing considerable humus and little clay and the other a clay loam soil, were conducted over a period of two years to determine the influence of plant roots on the soil structure and also the effect of physical changes within the soil itself. The soils were prepared by tamping some and puddling others into place, and still others were experimented with in a loose mellow condition. Plants representative of the two general types of rooting were grown on some of the soils while others were left bare.

It was found that different kinds of soils, especially those rich in clay, are loosened not only by absorbing water but also as a result of the effect of frost, variations in moisture content, etc. In loose soils a very small percentage of the spaces is filled by the stronger tap roots so that there is no essential decrease in the original mellowness from this source. In compact soils roots may

to a certain degree improve the structure and thus increase production. In compact stiff soils, without granular structure, the loosening process is aided, to the benefit of plant growth, by the mechanical action of roots and by a strong modification of the moisture conditions. Roots apparently seldom make practical use of the so-called "root holes" as a means of spreading in heavy soils. The growth of roots as regards their mechanical action varies in loose and compact soils. The beneficial combination of self-loosening and root action explains the frequent permanent improvement of the soil structure under the continued influence of roots, as in grass lands, and also the prevention of permanent puddling of the soil by rain.

Further studies of the influence of vegetation on the penetration and movement of water in the soils showed a beneficial influence, especially in meadow and pasture lands where there is a marked surface spreading of the roots. Although in these cases the lateral percolation of the water was somewhat retarded by the roots, loss of water through evaporation was also retarded and a comparison of soils with and without vegetation showed that the water movement was much more rapid in the former. However, in grain lands covered with crops only part of the year, an injury resulted and the soil became hard and compact, making frequent cultivation necessary.

The influence of subsoil loosening on soil yield, AUGSTIN (*Illus. Landw. Ztg.*, 33 (1913), No. 32, pp. 303, 304, figs. 2).—The opinion is expressed that the entire breaking up of a subsoil destroys capillarity, induces too much ventilation and drainage, and causes soluble plant foods to leach away. Cropping experiments on soil which had been completely subsoiled and on soil in which the subsoil had been broken only in a small furrow 3 cm. wide under each furrow were in favor of the latter method. Less power was expended in plowing by this method and it is stated that the looseness of subsoil lasts longer.

The minimum water capacity of soils and its cause, A. MOSKOVIĆ (*Mitt. Landw. Lehrkanz. K. K. Hochsch. Bodenkul. Wien*, 2 (1913), No. 1, pp. 209–243, figs. 3).—The author reviews the results obtained by several other experimenters and gives the results of a number of his own experiments made to determine the cause and limitations of the minimum water capacity of soils.

On the basis of these results the author concludes that the minimum water capacity of soils is the maximum amount of water which is independent of gravity, or that amount which is adsorbed by a permeable soil under certain fixed conditions of vapor and air pressure and temperature when a surplus of water is added. He further concludes that under similar conditions of vapor and air pressure, temperature, stratification, and size of grain every soil except alluvial soil has a constant minimum water capacity. The difference between minimum and absolute water capacity of the soil increases as the soil becomes coarser grained. The minimum water capacity of the soil is determined by the adsorbed or condensed water, so that the greater the condensing surface presented within a soil the higher is the minimum water capacity. However, since the adsorptive power of different soil constituents varies, the minimum water capacity is not proportional to the surface presented but only to the free surface tension. In porous soils the larger part of the water not adsorbed drains away below, but nonporous soils, such as fine grained sands if the grains are of suitable shape, form pores with closed walls which retain large quantities of water, so that such fine sands in spite of their small adsorptive power show a high minimum water capacity. The minimum water capacity of a soil is not altered by crumbling but is increased by puddling, which increases the surface tension.

Quantitative investigations on the reaction of aqueous extracts of soils, T. SAIDEL (*Bul. Sect. Sci. Acad. Roumaine*, 2 (1913–14), No. 1, pp. 38–44; abs.

in *Jour. Chem. Soc. [London]*, 104 (1913), No. 611, I, p. 1035).—An electrical method and apparatus for determining the reaction of soil extracts are described and tests of the method on different kinds of soil are reported.

Alkaline reactions caused by acids and their acid salts in soils. G. MASONI (*Stuz. Sper. Agr. Ital.*, 46 (1913), No. 4, pp. 241-273; *abs. in Chem. Zentbl.*, 1913, I, No. 24, p. 1999; *Jour. Chem. Soc. [London]*, 104 (1913), No. 611, I, p. 1036; *Chem. Abs.*, 7 (1913), No. 19, p. 3381).—"Organic and mineral acids and their acid salts are able to cause an alkaline reaction in soils. In calciferous soils calcium carbonate is formed, which in aqueous solution, on the addition of acid, parts with hydroxyl. The alkaline reaction may also be due to the action of acids on basic salts of magnesium, calcium, or aluminum. Acid alkali salts will give rise to alkali carbonates. The influence of the alkaline reaction on the biological function of the roots is discussed."

The chemistry of humus, with special reference to the relation of humus to the soil and to the plant. S. L. JODIDI (*Jour. Franklin Inst.*, 176 (1913), No. 5, pp. 565-573).—From a review of his own and other investigations the author concludes, in opposition to the earlier idea that humus is made up of but a few organic compounds, chiefly acid in their nature, that "more recent investigations have thrown enough light upon the chemical nature of humus or humus organic matter in the soil to demonstrate that it is a very complex substance which, in addition to the dark-colored humin bodies, contains a large number of organic compounds displaying acid, basic, neutral, and amphoteric character."

The value of humus in soils is attributed not only to the fact that it contains most of the elements necessary for plant life but that it affords a means for rendering more of the necessary inorganic elements available, improves the physical condition of the soil, and in short "makes the soil a more habitable and suitable home for the performance of the life functions of plants."

The nature of humus and its relation to plant life. S. L. JODIDI (*Biochem. Bul.*, 3 (1913), No. 9, pp. 17-22).—This article is substantially the same as the above.

Observations on the influence of plant covering on soil temperatures. J. FRÖDIN (*Lunds Univ. Årsskr.*, n. ser., Sect. 2, 8 (1912), No. 9, pp. 16, pls. 4, fig. 1).—Soil temperatures were observed in midwinter on snow-covered and open soils, both fallowed and planted.

It was found that on the coldest days the temperature at a depth of 10 cm. under the plant covering was the same as at a depth of 17 cm. in fallowed soil. The temperature at 10 cm. in the snow-covered soil was found to be equal to that at a depth of 27.4 cm. in naked soil. Since the plant covering of from 2 to 4 cm. apparently had the same effect as a soil layer 7 cm. thick, and the 10 cm. snow layer the same effect as a soil layer 17.4 cm. thick it is concluded that at the same thickness coverings of vegetation and snow would have the same effect. After a thaw it was found that under the snow the top layer of soil was warmer than a layer 20 cm. deep and that a still colder layer of soil existed between these two. This is attributed to heat radiation through the snow and is said to have a considerable biological and hydrographic influence.

A comparison of the daily ranges in temperature of soil covered with vegetation and fallowed soil showed that at 10 cm. depth the temperature range of the former was only 55 per cent of that of the fallowed soil and that the plant covering acted in this respect as a soil layer 9.1 cm. thick. Comparisons of the daily range in temperature in the same soils on clear quiet days in the late spring showed that the range at a depth of 10 cm. under vegetation was only 59 per cent of that of the fallowed land and that the plant covering acted

in this respect as a soil layer 8.6 cm. thick. It is further shown that the differences in range of temperature between soil covered with vegetation and naked soil have a particular significance to the biology and geography of some plants, especially the so-called Alpine plants.

The use of dialysis and the determination of oxidizing power in judging soils, J. KÖNIG, J. HASENBÄUMER and K. GLENK (*Landw. Vers. Stat.*, 79-80 (1913), pp. 491-534, pl. 1, figs. 2; *abs. in Zentbl. Agr. Chem.*, 42 (1913), No. 5, pp. 289-295; *Jour. Chem. Soc. [London]*, 104 (1913), No. 607, I, p. 578; *Zentbl. Bakt. [etc.]*, 2. Abt, 39 (1913), No. 4-7, pp. 184, 185).—Six different soils, namely, sand, sandy loam, loam, limestone soil, clay soil, and schistose soil, were subjected to dialysis, part in the natural state, part previously heated in a vacuum to from 95 to 98° C., part heated to from 150 to 180°, and part treated with hydrogen peroxid. After dialysis the amounts of organic matter, calcium, magnesium, potassium, phosphoric acid, and sulphuric acid were estimated.

The final results showed that only with dried clay soil did the quantity of substances obtained by dialysis fall below that of the natural soil. It was found that soils heated to 150° yielded more soluble matter than untreated soils. similar results, but less marked, were obtained with the soils dried at from 95 to 98°. The amounts obtained for sandy and sandy loam soils treated with hydrogen peroxid were considerably higher than those obtained from natural soils. From the results obtained, and since much time and considerable care and accuracy are required, it is concluded that dialysis can have no practical application in soil investigation.

Clearer indications of the changes which soils undergo when heated and when air-dried were obtained by estimating the electrolytic conductivity. The results indicate that the ordinary drying out of soils produces a partial suspension of the colloidal conditions and hence an increase in the solubility of the plant food in the colloidal combinations.

The amounts of carbon dioxid produced in six different soils and in the same soils with small amounts of dextrose and urea were estimated daily for three weeks. Contradictory results were obtained with and without dextrose, but at a mean temperature of 15.7° the limestone soil formed the largest proportion of carbon dioxid. At the end of this experiment the amounts of ammonia and nitrates and the number of bacteria were estimated. Urea was almost completely nitrified in the loamy soil while the clay soil showed only very slight nitrification. It was noted that the power of oxidation of a soil stands within certain limits which can not be exceeded within a given time with a given air supply. The addition of dextrose considerably increased the number of bacteria in all the soils, in sandy soils as much as eightfold. The catalytic power was affected in the same way except in the schistose and clay soils. The electrolytic conductivity was increased by clay and diminished by dextrose. It is concluded that determination of electrolytic conductivity is the best method of disclosing the changes taking place in the soil and further that the determination of oxidizing power is a very suitable method of investigating the properties of individual soils.

The results of pot experiments with oats showed that heating the soil at from 95 to 98° in a vacuum increased both the total growth and the mineral constituents. From this it is concluded that alternate drying out and wetting of the soil will promote the formation of soluble plant foods.

The addition of dextrose and gum arabic to loamy sand and loam diminished the yield of grain and straw. This is attributed to an excess of undecomposed sugar in the soil acting as a nonelectrolyte, impeding the movement of the ions in the soil, or as a colloid shield restricting flocculation of the colloids. The

taking up of food from the soil by plants is thought to be effected by an exchange of ions.

The employment of dialysis and the determination of the power of oxidation as a convenient method for the judgment of soils, J. KÖNIG (*Festschrift 84. Versamml. Deut. Naturf. u. Ärzte von der Med. Naturw. Gesell. Münster, 1912, pp. 57-77, pl. 1, fig. 1*).—See also the article noted above.

The soil solution and the mineral constituents of the soil, A. D. HALL, WINIFRED E. BRENCHELEY, and LILIAN M. UNDERWOOD (*Phil. Trans. Roy. Soc. London, Ser. B, 204 (1913), No. 307, pp. 179-200, figs. 2*).—Wheat and barley were grown in solutions made from soils on which wheat and barley had been grown for 60 years. The growth in the solutions was parallel to that on the plats and the composition of the solutions as regards phosphoric acid and potash corresponded to the past manurial treatment and present analysis of the plats. Growth in the solutions from imperfectly manured plats was brought to the level of that in solutions of completely manured plats by the addition of suitable salts. "Wheat grew as well as barley in the solutions of the wheat soils and vice versa. In a similar set of solutions from the same soil the growth of buckwheat, white lupines, and sunflowers corresponded with that of wheat and barley. Boiling effected no alteration in the nutritive value of the soil solutions."

"In nutritive solutions of various degrees of dilution the growth of plants varied directly, but not proportionally with the concentration of the solution, though the total plant food present in the solution was in excess of the requirements of the plant. When the nutrient solution was diffused as a film over sand or soil particles, as in nature, there was no retardation of growth due to the slowness of the diffusion of the nutrients to the points in the liquid film which had been exhausted by contact with the roots. Growth in such nutrient solutions forming a film over sand particles was much superior to the growth in a water culture of equal concentration, but the growth in the water culture was similarly increased if a continuous current of air was kept passing through it."

"From the results obtained it is generally concluded: (1) The composition of the natural soil solution as regards phosphoric acid and potash is not constant, but varies significantly in accord with the composition of the soil and its past manurial history.

"(2) Within wide limits the rate of growth of a plant varies with the concentration of the nutritive solution, irrespective of the total amount of plant food available.

"(3) When other conditions, such as the supply of nitrogen, water, and air are equal, the growth of the crop will be determined by the concentration of the soil solution in phosphoric acid and potash which, in its turn, is determined by the amount of these substances in the soil, their state of combination, and the fertilizer supplied.

"(4) On normal cultivated soils the growth of crops like wheat and barley, even when repeated for 60 years in succession, does not leave behind in the soil specific toxic substances which have an injurious effect upon the growth of the same or other plants in that soil."

The net result of these investigations is thought to uphold the theory of the direct nutrition of the plant by fertilizers.

Results of ten years' comparative field experiments on the action of fallow, manure, and clover, A. KOCH (*In Festschrift zum siebenzigsten Geburtstage von Jacob Esser. Berlin, 1913, pp. 57-93, figs. 3; Jour. Landw., 61 (1913), No. 3, pp. 245-281, figs. 3*).—Three systems of soil treatment were followed in the experiments reported in this article. These compared unfertilized black fallow, manure (on potatoes or beets), and clover in a rotation of three cereals

(winter wheat, rye, and oats or summer barley). The soil used in the experiments was a friable loam.

Detailed data for yield and value of the crops and the nitrogen content of the soil at different periods of the experiments are summarized. These indicate little or no decline of the nitrogen supply of the soil or of yield with bare fallow as compared with the manure and clover rotations.

The addition of cellulose to the soil as a source of energy increased the activity of bacteria which convert nitrates into albuminoid substances, and thus decreased the growth of crops. As soon as the cellulose was consumed, however, no further transformation of nitrates occurred and the plants began to make normal growth. The author concludes from this that nitrates are essential to plant growth in natural soils.

Soil hygiene and green manuring, F. ARNDT (*Mitt. Ökonom. Gesell. Sachsen, 1912-13, pp. 29-70*).—The author discusses soil moisture regulation and physical and chemical harmony in soils, and reports the results of his experiments made to demonstrate the value of legumes for green manuring.

Report of the agriculturist, E. F. GASKILL (*Massachusetts Sta. Rpt. 1912, pt. 1, pp. 21-34*).—This is a report of progress in fertilizer experiments following the same general lines as in previous years, including plat and pot tests (E. S. R., 28, p. 325).

The management of solid and liquid manures, M. RINGELMANN (*Aménagement des Fumiers et des Purins. Paris, 1913, pp. 187, figs. 103; rev. in Rev. Sci. [Paris], 51 (1913), II, No. 7, p. 219*).—This book deals very fully with the methods, structures, and appliances employed in the preservation and handling of farm manures, more especially liquid manures. The subject is considered from the sanitary standpoint as well as from that of practical utilization of the manures on the farm. Methods and appliances for distributing the manures and manure liquors receive particular attention.

Enrichment of farmyard manure by cake feeding, A. D. HALL (*Jour. Bd. Agr. [London], 20 (1913), No. 8, pp. 665-672*).—On the basis mainly of experiments made at Rothamsted, but also from a study of farm accounts, the author concludes that the addition of oil cake to the feed of cattle enriches the manure in quickly available fertilizing constituents, but does not greatly increase its ultimate effect. He is of the opinion that the value of the practice of using cake is overestimated, particularly in case of light soils.

Comparative tests of lime nitrogen, nitrogen lime, sodium nitrate, and ammonium sulphate on sandy and upland moor soils, B. TACKE and F. BRÜNE (*Landw. Vers. Stat., 83 (1913), No. 1-2, pp. 1-100*).—Pot experiments with different crops under a variety of conditions gave results indicating that the lime nitrogen prepared by the Frank and Caro process and nitrogen lime prepared by the Polzenius process are equally effective on sandy soils, but that the nitrogen lime is only about 81 per cent as effective as that of lime nitrogen on moor soils. The experiments indicated that neither product should be applied at the same time as the seed, as if applied at this time the fertilizing effect is only 44 per cent of that of sodium nitrate. Applied as a top-dressing the materials are from 66 to 67 per cent as effective as sodium nitrate in the case of rye and from 80 to 82 per cent as effective in the case of oats and potatoes. The best results were always obtained when the materials were applied a short time before seeding, when they were on the average 89 per cent as effective as sodium nitrate. The utilization of the nitrogen by plants was only 54 per cent of that of sodium nitrate on sandy soils and 67 per cent on moor soils.

The lime-nitrogen industry, E. O. SIEBNER (*Chem. Ztg., 37 (1913), Nos. 106, pp. 1057, 1058; 108, pp. 1073-1075*).—This is a brief review of the present status of the industry.

Nitrogenous fertilizers obtainable in the United States, J. W. TURRENTINE (*U. S. Dept. Agr. Bul. 37, pp. 12*).—Statistics of production and consumption for fertilizing purposes of sodium nitrate, ammonium sulphate, synthetic nitrogen compounds (calcium cyanamid and nitrate), tankage, and dried blood are summarized and discussed.

It is estimated that the use of these materials in fertilizers in the United States during 1912 was approximately as follows: Ammonium sulphate (production in United States 155,000 tons, imports 60,000 tons) 215,000 tons; sodium nitrate (about 13 per cent of the imports, 518,613 tons) 70,000 tons; calcium cyanamid 11,264 tons; tankage 99,324 tons; dried blood 37,710 tons; fish scrap 70,000 tons. See also a previous note (*E. S. R.*, 29, p. 517).

Figures are given which indicate that less than one-sixth of the recoverable ammonium sulphate lost in beehive coke ovens in the United States is now saved. Estimates by the Bureau of Animal Industry indicate that if all the slaughterhouse wastes were saved the possible production of tankage would be 222,535, of dried blood 79,794 tons.

The replacement of potash in certain feldspathic rocks by substances used as fertilizers, G. ANDRÉ (*Compt. Rend. Acad. Sci. [Paris]*, 157 (1913), No. 19, pp. 856–858; *abs. in Rev. Sci. [Paris]*, 51 (1913), II, No. 21, p. 668).—The results reported by the author show the important rôle played by the phenomena of double decomposition which occurs when soluble fertilizing materials are added to the soil.

The replacement of potash by soda was especially marked when microcline was mixed with sea salt or with sodium nitrate, the amount of potash replaced being almost identical in the two cases. This replacement explains the favorable action of salt when used as a fertilizer. Sodium nitrate when applied to the soil is thus a means of furnishing a certain amount of potash to plants as a result of double decomposition in contact with particles of feldspar. Ammonium sulphate is also particularly active in replacing potash.

Investigations on the composition of Thomas slag, M. POPP (*Österr. Chem. Ztg.*, 16 (1913), No. 21, pp. 291, 292).—Four different crystalline forms occurring in Thomas slag are described and their varying solubility in citric acid is discussed. Certain rhomboidal blue crystals occurring in the slag were found to be 95 per cent soluble in citric acid, while the brown columnar crystals found were only 41 per cent soluble.

In ground slag it was found that the finest particles had the highest percentage of phosphoric acid, silicic acid, and lime, and the lowest percentage of iron. Separating the coarser particles by means of an electromagnet it was found that the nonmagnetic part was almost identical in composition with the fine meal. While the phosphoric acid of the coarse particles, as a whole, was 13 per cent soluble, that of the magnetic particles was 20 per cent soluble.

A method of electro-dialysis was tried by which it was possible to separate the particles into groups corresponding to their solubility in citric acid.

Investigations on the action of steamed and unsteamed bone as a phosphatic fertilizer in comparison with superphosphate and Thomas slag as well as on the importance of grinding unsteamed bone, B. SCHULZE (*Land. Vers. Stat.*, 83 (1913), No. 1–2, pp. 101–130).—In a series of pot experiments it was found that the phosphoric acid of Thomas slag soluble in citric acid was about 90 per cent as effective as the water soluble phosphoric acid of superphosphate the first year. Its utilization by plants was about 81 per cent of that of water soluble phosphoric acid. The after effects, however, in a measure compensated for the poor results the first year.

The effect of the phosphoric acid of bone meal during the first year was barely half that of superphosphate. In the course of three years the average

effect of the phosphoric acid of bone meal was about 60 per cent of that of water soluble phosphoric acid. The phosphoric acid of steamed bone meal was somewhat more effective than that of unsteamed bone; the results, however, varied with the plants grown. The difference in effect on cereals and on such crops as mustard, buckwheat, and spurry was especially marked. In no case, however, did the bone meal approximate in fertilizing efficiency the water soluble or citric acid soluble phosphoric acid.

Fine grinding of the unsteamed bone appreciably increased the fertilizing efficiency of the phosphoric acid.

The use of raw phosphate and siliceous lime as fertilizers, T. PFEIFFER (*Zentbl. Kunstdünger Indus.*, 18 (1913), Nos. 21, pp. 457, 458; 22, pp. 473, 474).—Reviewing work by others the author concludes that raw phosphates may be profitably substituted for Thomas slag under certain circumstances, as, for example, on acid peaty soils, but that the conditions under which they are effective need to be carefully studied. The work of Immendorff and others shows that siliceous lime may be applied to soils without injury and even with benefit under certain conditions.

Agricultural value of carbonate of lime recovered from causticizing plant, J. HENDRICK (*Rpt. Brit. Assoc. Adv. Sci.*, 1912, p. 741).—This material is described and field experiments with it are reported which showed that it compared favorably with other forms of lime as a fertilizer.

The action of quicklime on the soil, H. B. HUTCHINSON (*Rpt. Brit. Assoc. Adv. Sci.*, 1912, p. 740).—Observations are reported which show that the addition of small quantities of quicklime to field and garden soils stimulates general bacterial growth, but that large quantities cause an initial depression in the numbers of bacteria, the destruction of certain large protozoa, and a cessation of all biological processes. When the lime is converted into carbonate or combines with the soil constituents there is a great increase in the number of bacteria and acceleration of ammonification.

"The length of the period during which bacterial growth is suspended would appear to be determined by the quantity of lime applied, the initial reaction of the soil, and the amount of organic matter present.

"Pot experiments have been carried out with variously limed soils, and the crop results show close agreement with those obtained by bacteriological and chemical analyses."

Mineral and nitrogen contents of pine needles and straw, H. BAUER (*Ztschr. Forst u. Jagdw.*, 45 (1913), No. 10, pp. 659, 660).—Analyses of needles and of straw of *Pinus cembra* in various stages of decomposition are reported. The percentages of ash and nitrogen were found to be very small but increased with the age of the material. The increase of mineral constituents with age and stage of decomposition was especially marked in the case of the lime. The potash on the other hand decreased with age.

Tobacco stalks as a fertilizer, H. D. HASKINS (*Massachusetts Sta. Rpt.* 1912, pt. 2, pp. 80-84).—This article gives analyses and discusses the fertilizing value of various samples of leached and unleached tobacco stalks. Stalks obtained in the so-called priming system of harvesting the crop contained much less fertilizing matter than those obtained by stripping in the ordinary manner. Stalks which had been allowed to lie on the land during the fall and winter months had lost about 57 per cent of the total nitrogen and 51 per cent of the total potash.

Chemical industries of Belgium, Netherlands, Norway, and Sweden, T. H. NORTON (*U. S. Dept. Com. and Labor, Bur. Foreign and Dom. Com., Spec. Agents Ser.*, 1912, No. 65, pp. 85).—Data regarding the production of various

materials used as fertilizers and for other agricultural purposes are included in this report.

Report of the fertilizer section, H. D. HASKINS (*Massachusetts Sta. Rpt. 1912, pt. 1, pp. 103-118*).—A brief account is given of the State fertilizer inspection and the character and quality of fertilizing materials used in the State are discussed.

AGRICULTURAL BOTANY.

The action of certain nutrient and nonnutrient bases on plant growth, M. M. McCool (*New York Cornell Sta. Mem. 2, pp. 115-216, figs. 15*).—This memoir consists of three papers as follows: (1) The antitoxic action of certain nutrient and nonnutrient bases with respect to plants, (2) the toxicity of manganese and the antidotal relations between this and various other cations with respect to green plants, and (3) toxicity of various cations.

Extensive studies on the toxic and antidotal action of various ions were made, and the chief conclusions which were derived from the experiments are that barium, strontium, ammonium, magnesium, sodium, and potassium were poisonous to seedlings in the order given. Mutual antagonism resulted when the following cations were present in solution: Magnesium and strontium, potassium and strontium, sodium and strontium, sodium and potassium, sodium and ammonium, potassium and barium, and magnesium and barium. Calcium was found the most effective of any of the substances studied in preventing toxic action. This protective action was found to be not confined to the so-called essential nutrients, as some of the nonessential ions possessed this property. The favorable results obtained from the application of lime to many types of soils is believed to be due in part to the antidotal relations.

In considering the toxicity of manganese the author studied its effect in various cultures, using pea and wheat seedlings. It was found that pure solutions of manganese salts are extremely poisonous to pea and wheat seedlings, and that the degree of toxicity is greatly reduced by full nutrient solutions and by soil cultures. The injurious action of the manganese ion is manifested mainly toward the tops of plants, chlorosis of the leaves being the first indication of an overdose of manganese. Manganese was found less injurious to plants grown in the dark than to those in the light, and the ions of calcium, potassium, sodium, and magnesium were effective in counteracting the poisonous action of manganese.

In the report upon the toxicity of various cations the author reviews the literature and summarizes his investigations, showing that barium, strontium, ammonium, magnesium, sodium, and potassium, in the order given, when present in pure solution are very toxic to seedlings. This toxicity is greatly reduced by either full nutrient solutions or soil cultures. Under the conditions of the experiments much stronger solutions were required in order to prevent top growth than to kill the roots of seedlings. Seedlings which had been grown for 10 days either in distilled water, tap water, or full nutrient solutions were found more resistant to the toxicants studied than those which were placed immediately in the toxic solutions.

Bibliographies of literature are appended to the different papers.

Application of fertilizers to plants through their leaves, P. LARUE (*Rev. Vit., 40 (1913), No. 1028, pp. 261-264*).—Experiments suggested by the reports of Hiltner on his work in applying fertilizing solutions to aerial portions of plants (*E. S. R., 27, pp. 324, 651*) were carried out by the author with various plants.

Potatoes were increased in weight by the use of several different applications. Results with mustard and soy beans were variable, some compounds tested appearing toxic. In case of grapevines the conclusion is reached that mixtures used against attacks of fungi, etc., may be so proportioned as to give these sprays a decided value as aerial fertilizers if the necessary higher degree of adherence can be secured to prevent their removal by rains.

Saponins as a source of carbohydrates for vegetation, F. SOLACOLU (*Compt. Rend. Soc. Biol. [Paris]*, 74 (1913), No. 6, pp. 304-306).—The author reports on culture experiments with *Aspergillus niger* and *Penicillium glaucum* in nutritive media containing various saponins named, most of which were commercially prepared, stating that all served as nutritive material for these fungi.

Studies on the distribution of asparagin, glutamin, arginin, and allantoin in plants, A. STIEGER (*Hoppe-Seyler's Ztschr. Physiol. Chem.*, 86 (1913), No. 4, pp. 245-269).—The results are given of investigations carried out regarding the occurrence and proportion of these products in various portions of the plant body, numerous families of plants being represented in the study.

It is stated that asparagin and glutamin were frequently found together in various proportions and sometimes in different families, leading to the conclusion that these products are in some instances used or stored at very unlike rates, the differences in this respect being apparently family characteristics in certain cases. Arginin almost always accompanied asparagin, but less regularly glutamin. Allantoin showed no such close relation to the other compounds in question and no conclusion was reached regarding the part it plays in plant economy.

The formation of the anthocyan pigments of plants, VI, F. KEEBLE, E. F. ARMSTRONG, and W. N. JONES (*Proc. Roy. Soc. [London]*, Ser. B, 87 (1913), No. B 593, pp. 113-131).—This is in continuation of a series of papers (E. S. R., 29, p. 421), the present one dealing with the pigment-producing glucosid of the wallflower, the formation of pigment-producing substances from glucosids, and the biochemistry of Mendelian color characters.

The pale yellow sap color of the petals of the wallflower is said to be a mixture of hydroxyflavone glucosids. The hydrolyzed product if reduced and subsequently oxidized yields a red pigment. The fact that flowers containing yellow pigments may be caused, by chemical treatment, to yield a red pigment suggests that red mutations should be of possible occurrence within the species. The formation of pigments, as the results of oxidation by oxidase of the hydrolyzed products of glucosids, is determined by the presence of aminocompounds and is of general occurrence.

The authors give a classification of pigments as determined by their investigations. It is suggested as a hypothesis that the higher members of a flower color series owe their origin to the presence with the lower members of specific substances which, acting as receivers of oxygen, reduce the pigments characteristic of the lower members of the color series, accept oxygen therefrom, and thereby become oxidized to pigments of specific color.

Synthesis by sunlight in relationship to the origin of life.—Synthesis of formaldehyde from carbon dioxid and water by inorganic colloids acting as transformers of light energy, B. MOORE and T. A. WEBSTER (*Proc. Roy. Soc. [London]*, Ser. B, 87 (1913), No. B 593, pp. 163-176).—The authors found that organic matter (aldehyde) was synthesized from inorganic colloidal uranic and ferric hydroxids in very dilute solution. These colloids are believed to act as catalysts for light energy, converting it into chemical energy in a reduction process similar to the first stage of synthesis of organic from inorganic substances in the green plant by the agency of chlorophyll. Such a synthesis

occurring in nature, they think, would probably constitute the first step in the origin of life.

Hemicellulose in roots, rhizomes, and tubers, A. STIEGER (*Hoppe-Seyler's Ztschr. Physiol. Chem.*, 86 (1913), No. 4, pp. 270-282).—The author details the results of examinations made on the subterranean parts of 15 plants. He found hemicelluloses in all, but was not able to settle the question as to whether these serve as structural or exclusively as reserve material. A bibliography is given.

Protoplasmic contractions resembling plasmolysis which are caused by pure distilled water, W. J. V. OSTERHOUT (*Bot. Gaz.*, 55 (1913), No. 6, pp. 446-451, figs. 6).—This amplifies a preliminary account already noted (*E. S. R.*, 29, p. 134) and gives some details of the study.

It is stated that in many cases contractions in young cells closely simulating true plasmolysis may take place with great rapidity on immersion in pure water, while older cells respond more slowly and show by alterations of their chromatophores that they are undergoing false plasmolysis. True and false plasmolysis may be produced simultaneously, these contractions usually becoming irreversible at a certain point. The effects observed for distilled water were also produced by that from ponds, rivers, and springs, and are therefore held not to be due to toxic products of distillation.

It is held that the cause of these phenomena is increased permeability of the plasma and internal cell membranes, as the result of which some or all of the osmotically active substances diffuse out. The protoplasm then shrinks as the result of the water loss from the vacuoles, this being often followed by apparent coagulation of the protoplasm, with most of the features characteristic of cytolysis in animal cells usually absent. Absorption of water as a cause is precluded by the fact that the cells do not increase in size. The increased permeability is held to be due to the loss of certain substances upon which the maintenance of normal permeability depends (the most important being the inorganic salts), which is followed by increased permeability of the cell membranes as measured by electrical means.

Toxic inorganic salts and acids as affecting plant growth, C. B. LIPMAN and F. H. WILSON (*Bot. Gaz.*, 55 (1913), No. 6, pp. 409-420).—Tabulated results are given of preliminary studies made on vetch and wheat as to the effects thereon of varying proportions in the soil of sulphuric acid and of its copper, zinc, and manganese salts, leading to the conclusion that the tolerance of plants for certain of the inorganic salts commonly regarded as very poisonous is much greater than we have been accustomed to believe. Some plants are said to be actually stimulated by quite considerable proportions of such salts. A further search for the limits of toxicity is in progress. The work is claimed to present new evidence regarding the stimulating effects of manganese sulphate on the growth of plants. Certain facts are thought to indicate that the soil flora is permanently modified by the treatment of the soil as herein outlined.

Arsenic compounds in agriculture and possible danger from their use, G. AMPOLA and G. TOMMASI (*Ann. R. Staz. Chim. Agr. Sper. Roma*, 2. ser., 5 (1911), pp. 263-277, pls. 2; *abs. in Centbl. Bakt. [etc.]*, 2. Abt., 38 (1913), No. 7-12, pp. 230, 231).—It was found that arsenic acid is injurious to green plants when present in nutritive solutions in concentrations not less than 1 mg. per liter of water. Bean plants died after 24 days in 3 mg. and maize after 27 days in 5 mg. per liter, lupines showing an intermediate degree of resistance, and no plants showing growth at a concentration of 20 mg. per liter.

In soil cultures the limits were more difficult to determine on account of absorption, but growth was usually checked at a concentration corresponding to 0.3 mg. of arsenic per kilogram of soil. The arsenic mostly went to the

leaves, but small proportions were found in the fleshy or juicy portions in the case of gourds, tomatoes, and beans when fresh, only traces being found in dried grains, peas, etc. Absorption of arsenic by soil is said to vary with the concentration and time and to be incomplete.

Arsenic was recovered from the soil under olive trees that had been sprayed therewith for olive fly. It is considered necessary to regulate the use of arsenic in such connection on account of possible injury therefrom.

Studies on the anatomical and physiological influence of tobacco smoke on seedlings, A. PURKYT (*Anz. K. Akad. Wiss. [Vienna], Math. Naturw. Kl., 1912, No. 17, p. 265; abs. in Centbl. Bakt. [etc.], 2. Abt., 38 (1913), No. 7-12, p. 211*).—The author reports that in tobacco smoke plants develop high turgor which is later gradually lost; that abnormal thickening of the stems is due to growth in the size but not in the number, of cells, which in case of the leaf epidermis is expressed in alterations of form, hypertrophy of stomata, and deformation of leaf hairs; and that along with other changes mentioned, the formation of both wood and bast fiber is limited by exposure to tobacco smoke.

Injuries to vegetation by furnace gases and ashes, H. C. MÜLLER ET AL. (*Ber. Agr. Chem. Kontroll u. Vers. Stat. Pflanzenkrank. Prov. Sachsen., 1912, pp. 19-22*).—A condensed and apparently preliminary account is given regarding the probable or actual injury done to vegetation in the neighborhood of certain furnaces, factories, etc., distributing smoke gases, ashes, and dust. An illustrative table is given showing that leaves and twigs of hawthorn in an exposed situation gave a considerable increase of the ash, chlorin, and sulphur content.

Effects of illuminating gas on vegetation, G. E. STONE (*Massachusetts Sta. Rpt. 1912, pt. 1, pp. 45-60, pls. 2*).—The author presents a general description of the effects of gas poisoning on trees and gives a number of specific examples of injurious as well as stimulating effects due to illuminating gas. The symptoms of gas poisoning are said to be best obtained from a careful examination of the wood at the base of the tree or the roots.

During the winter a break in a gas pipe led to the defoliation of a large number of plants in a short time. Those most severely injured were roses, geraniums, and abutilon, though others were also somewhat injured. The ferns, mosses, and liverworts near the gas inlet were scarcely affected. After being defoliated the geraniums and abutilon produced small leaves, and the leaves on the variegated abutilon which were put out were entirely green.

On Carolina poplars illuminating gas is said to show some characteristic effects. The symptoms of gas poisoning are generally a peculiar swelling and cracking of the bark, the lesions often extending for a foot or more along the trunk. On the sides of these cracks the bark was bulged out and examination showed a thick layer of soft parenchymatous tissue extending to the wood and apparently derived from the cambium zone. It is believed that the absorption of the gas may have killed the tissue exterior to the cambium layer before the cambium itself was affected, and that, in this way, the tension of the outer tissues being diminished, a stimulation of the cambium cells resulted.

When willow cuttings were grown in water charged with illuminating gas from time to time, there was found to be a slight acceleration in the development of all plants subjected to gas, although the gain was not very marked. The development of the lenticels and roots seemed to be considerably favored where the cuttings were placed in the gas-charged water.

Influence of a radio-active body on germination, J. CROCHETELLE (*Jour. Agr. Prat., n. ser., 26 (1913), No. 37, pp. 332, 333, fig. 1*).—The author gives a preliminary report of his experiments regarding the influence of radio-active substance on some common plants, stating that while the results obtained with different plants were not uniform, bean seedlings so treated showed a striking

acceleration of growth, which was more marked in cases where the radioactive powder was applied directly than where plants in tubes were exposed thereto.

Semipermeability of seed coats, C. A. SHULL (*Bot. Gaz.*, 56 (1913), No. 3, pp. 169-199, figs. 9).—The author gives an account of investigations carried on for two years regarding the character of the seed coat of *Xanthium*, with particular reference to the work of Becquerel (*E. S. R.*, 19, p. 426), Brown (*E. S. R.*, 18, p. 727), and Schroeder (*E. S. R.*, 25, p. 123), with conclusions substantially as follows:

The dry seed coats of *Xanthium* are impermeable to dry alcohol, ether, chloroform, and acetone. Becquerel's results with coats of other seeds are confirmed. No evidence of diffusion of oxygen through dry seed coats was obtained. Selective semipermeability independent of living substance was established for the seed coat of *Xanthium* (lists being given of substances admitted or excluded), which, it is said, may be removed and used as an osmotic membrane of superior quality. The outer layer of the testa can not so function, and the inner exceeds the middle layer in this respect, neither of these two being so efficient alone as before their separation. The middle coat contains more tannin than the inner, but the tannin does not exist in either as a continuous layer, and semipermeability is not destroyed by treatment with solvents of tannin. Semipermeability is said to have been demonstrated for the seed coats of plants in six widely separated families, membranes of many plants showing this property even when dead. It is said that the capillary and imbibition force of the embryo of *Xanthium* when the seed is air dry is about 965 atmospheres, and that an increase in the moisture of the embryo equal to 7 per cent of its air dry weight reduces the internal forces by 590 atmospheres. It is stated that the unusual intake of water noticed with some substances, especially with certain acids and alkalis, is due largely to the development of osmotically active substances inside the semipermeable membrane; also that some evidence was obtained unfavorable to Armstrong's hydrone theory of selective semipermeability (*E. S. R.*, 21, p. 126).

A bibliography is appended.

The influence of partial suppression of the reserve material in seeds upon the anatomy of plants, M. DELASSUS (*Compt. Rend. Acad. Sci. [Paris]*, 157 (1913), No. 3, pp. 228-230).—Reporting on an extension of studies already noted (*E. S. R.*, 26, p. 729), the author gives comparative results obtained, concluding that the effects of mutilation of cotyledons upon the anatomical structure of the young plants produced therefrom are marked, showing a retarded and diminished growth expressed by lowered development of the tissues, especially those concerned with support and protection.

The function of grape leaves in relation to the clusters, A. MARESCALCHI (*Staz. Sper. Agr. Ital.*, 45 (1912), No. 12, pp. 940-944).—Experimentation is said to have shown that grape clusters on defoliated shoots still form a considerable amount of sugar, also that while quite a proportion of acid is noted there is a deficiency as regards diffusible coloring matters.

Some points on the floral development of red clover, J. N. MARTIN (*Proc. Iowa Acad. Sci.*, 19 (1912), p. 129).—This is a brief discussion of the relative rates of development of different parts of the flower of red clover, the resulting inequalities observed, and the changing relations sustained. A more detailed account is to appear later.

Demonstrations of ectotrophic and endotrophic mycorrhiza, W. B. McDougall (*Rpt. Mich. Acad. Sci.*, 14 (1912), p. 45).—An abstract is given of a report on an investigation conducted to determine if possible the seasonal, physiological, and ecological relations of mycorrhiza.

On the shellbark hickory three forms of ectotrophic mycorrhiza were found. One of these is bright yellow in color, distinctly filamentous, and has numerous short branches extending into the soil. The second form is brown, the fungus mantle consisting of pseudoparenchyma such as is found in many lichens. The third form is whitish or nearly colorless, distinctly filamentous, but smooth on the outside.

On oaks the same variations in microscopic structure were found, but without the variations in color, all specimens collected being whitish. On larch a form was found in which the outer cells of the root cortex were pushed apart by the growth of mycelia between them. Endotrophic mycorrhiza were found in great abundance on maples, while on American linden the same fungus was found to be both ectotrophic and endotrophic.

Contributions on the colorless sulphur bacteria, G. HINZE (*Ber. Deut. Bot. Gesell.*, 31 (1913), No. 4, pp. 189-202, pl. 1).—The author studied two sulphur bacteria found in slime and mud in the Bay of Naples, one being already known as *Monas mülleri*, the other being considered as new and named *Thiovulum* n. gen.

Culture of micro-organisms, E. KÜSTER (*Kultur der Mikroorganismen. Leipzig and Berlin, 1913, 2. ed., rev. and enl., pp. 218, figs. 26*).—This is the second edition of a book previously noted (E. S. R., 19, p. 932).

FIELD CROPS.

Causes of the increased yields of agricultural crops during the last three decades, D. LEHN (*Illus. Landw. Ztg.*, 32 (1912), Nos. 69, pp. 627, 628; 70, pp. 636-638).—The author discusses the increased yields during the last three decades and attributes them to the increased intelligent use of commercial fertilizers, the introduction of better producing varieties, management systems, and methods of soil cultivation.

Making money on farm crops, F. B. NICHOLS (*St. Joseph, Mo., 1913, pp. 288, figs. 80*).—This book discusses soils for crops and the improvement of farm crops, with chapters on the production of alfalfa, clover, cowpeas, corn, wheat, oats, and the sorghums.

[Experiments with field crops] (*Abs. in Jour. Bd. Agr. [London], 19 (1913), Nos. 11, pp. 936-939; 12, pp. 1029-1031; 20 (1913), No. 1, pp. 42-47*).—Several abstracts are given of reports of locally conducted experiments in Great Britain with grasses, mangolds, wheat, barley, sugar beets, permanent pastures, potatoes, oats, peas, tobacco, millet, and Chinese alfalfa.

Field experiments (*Yorkshire Council Agr. Ed. and Univ. Leeds [Pamphlet] 85, 1912, pp. 2-36*).—In fertilizer experiments with meadow hay, the unmanured plats consisted chiefly of bent and sorrel. Barnyard manure applied each year seemed to encourage the growth of the better grasses, especially fox-tail and cocksfoot, and to repress bent. Applied in alternate years it apparently increased the growth of the desirable grasses, particularly golden oat grass. Using barnyard manure and complete artificials in alternate years encouraged foxtail and cocksfoot, golden oat grass, and tall oat grass, but the highest percentage of good grasses followed a complete mixture of artificials applied every year. With niter and superphosphate applied annually desirable grasses and also sorrel to a slight extent were fostered, while with nitrate of soda alone cocksfoot and tall oat grass thrived at the expense of bent, and with sulphate of ammonia alone cocksfoot thrived at the expense of foxtail and golden oat grass. Lime did not seem to increase the yield of hay but to suppress the growth of sorrel.

Plans of manurial experiments with pasture grasses, potatoes, and swedes are given.

[Field crop experiments], P. H. FOULKES (*Field Expts. Harper-Adams Agr. Col., and Staffordshire and Shropshire, Rpt. 1912, pp. 3-14, 21, pl. 1*).—In these experiments lime seemed to be of benefit to grass lands. Two and one-half cwt. of superphosphate and $\frac{1}{2}$ cwt. of sulphate of potash apparently gave better results than other fertilizers used, the yield being 39 cwt. 32 lbs. of hay per acre.

Variety tests with wheat, oats, swedes, mangels, and sugar beets are given in tabular form. The results of fertilizing with a radio-active substance containing silica 80.44, water and volatile organic matter 10.54, oxid of iron and alumina 2.20, total sulphuric acid 5.40, soluble phosphoric acid 1.37, and soluble salts and soluble free acids 3.32 per cent, with a trace of uranium, and applied with a commercial fertilizer at the rate of 2 per cent of the total application, were contradictory with swedes, but increased yields of from 2 to 4 tons per acre followed its use with mangels.

Forage crop trials are reported with alfalfa, sainfoin, wold grass, crimson clover, *Lathyrus sylvestris*, flax, and Heliantia. A Chinese alfalfa produced at the rate of 4 tons 1 cwt. per acre. Wold grass, cut June 13, yielded 10 tons 6 cwt. per acre, and flax yielded 520 lbs. seed and 26 cwt. fiber per acre.

Manurial experiments, G. BALFOUR and J. C. RUSHTON (*Field Expts. Harper-Adams Agr. Col., and Staffordshire and Shropshire, Rpt. 1912, pp. 46-58*).—Tabulated results are given of manurial experiments carried on at 11 centers with meadow hay, mangels, swedes, potatoes, sugar beets, and alfalfa. Basic slag, 500 lbs. per acre, in place of superphosphate (300 lbs.) seemed to check greatly the "potato disease." At one center 300 lbs. of barnyard manure per acre apparently produced increased yields with mangels.

Report of Hedemarken Experiment Station, 1912, W. CHRISTIE (*Ber. Hedemarkens Amts Forsöksstat. Virks., 8 (1912), pp. 59, pls. 3*).—Accounts of the following lines of investigations are given: Trials with seed potatoes of different sizes, with different distances of planting, and with whole and cut seed potatoes, 1908-1912; the starch content of samples of potatoes, 1912; trials with alfalfa, 1906-1911; farm manure and artificial fertilizers for turnips, 1907-1911; and top-dressing with artificial fertilizers for meadows, 1910-1912.

Report of Ribe County Western Agricultural Society, 1912, N. ESBJERG (*Ber. Ribe Amts Landbofor. Havebr. og Husmands., 1913, pp. 34*).—The experiments with shelter for agricultural crops, which were commenced in 1909 (*E. S. R., 28, p. 40*), were continued during 1912. The results obtained corroborated those previously reported, showing that shelter had a very beneficial influence on the growth of farm crops and increased the yields obtained in a marked degree. The planting and care of windbreaks and hedges which break the force of the wind therefore doubtless constitute a phase of profitable permanent farm improvements.

Report of the plant culture stations, 1912-13, H. C. LARSEN ET AL. (*Ber. Stat. Planteavl. [Denmark], 1912-13, pp. 150*).—A brief account of the organization and activities of the different Danish plant culture stations during the year.

Plant breeding at Tystofte, E. LINDHARD (*Tidsskr. Landbr. Planteavl, 20 (1913), No. 1, pp. 1-23, figs. 5*).—The paper gives the general principles followed in the plant breeding work done at this experiment station.

A method for variety tests, O. BILGER (*Illus. Landw. Ztg., 32 (1912), No. 91, pp. 827-829, figs. 3*).—This article discusses conditions arising from irregularities in soils and the need of multiplication of plats to reduce experimental error and secure comparative yields. A method of using 100 plats, 2.4 meters

square, in which 20 varieties were so arranged as to repeat each 5 times, is explained and illustrated. The use of the formula $\frac{\Sigma \pm d \cdot 0.845}{\sqrt{n(n-1)} \cdot \sqrt{n}}$ is explained in calculating the probable experimental error for these 20 plats. In this formula Σ = the sum of the yield of the repeated plats; d = the difference in yield from the mean; n = the number of plats, and 0.845 is a constant. By the use of this formula the author states that the probable error for each plat may be determined and so increase the accuracy and usefulness of the result of a test.

The influence of different vegetative factors on yield and counteracting relations of artificial factors added to the soil, E. A. MITSCHERLICH and R. FLOESS (*Landw. Jahrb.*, 43 (1913), No. 4, pp. 649-668, figs. 3).—In this article the authors discuss the law of minimum yield, the vegetative factors of light, soil temperature, and water, and the opposing influences of artificial vegetative factors in the way of fertilizers. It was noted that responsive energy was at its optimum in sunlight; that active energy in the roots was the result of soil temperature and favored increased yields; that loss of energy through increased root labor was a factor in decreasing yields; that the plant yield correlated with soil water subject to the law of minimum; and that yields were limited by the small quantity of soil water, but favored when this water was in the upper soil layer and when the plant food was such as to be soluble in the water during the entire vegetative period, so that the roots were relieved of heavy work.

Cereal investigations at the Nephi [Utah] substation, P. V. CARDON (*U. S. Dept. Agr. Bul.* 30, pp. 50, figs. 9).—This bulletin contains a report of the work of the substation, previously mentioned (*E. S. R.*, 23, p. 434), and includes a description of the substation and of the soil and climatic conditions that surround it. Tables give some meteorological data for the years 1898 to 1912, inclusive. The experimental work reported consists mainly of varietal and improvement tests of 68 varieties and strains of winter wheat, 1 of winter oats, 3 of winter barley, 2 of winter emmer, 10 of spring wheat, 7 of spring oats, and 14 of spring barley. Tables present data concerning yields, stand, dates of ripening, height, ratio of weight of grain to straw, and average weight per bushel of wheats and barleys, and the results of testing large, medium, small, and unseparated seeds of wheat planted at different distances in the row.

The results obtained show that "the winter varieties of all cereals have given better results than have the spring varieties. Of the winter wheat varieties, the hard red group has given the best yields. The soft white group, commonly grown in the Intermountain States, is comparatively low in yield. There seems to have been no definite correlation between stand and yield. The average date of heading and also the average date of ripening were about the same for all varieties. The average height of the winter wheats at Nephi during 1908 to 1912, inclusive, was 27 in. Approximately 1 lb. of grain was produced with every pound of straw.

"The average bushel weight for all varieties of winter wheat for the 5-year period was 61.4 lbs., or 1.4 lbs. above the standard weight. The average acre yield of spring wheats since 1908 is only 7.5 bu. for durum varieties and 8.9 bu. for common varieties, which is unprofitable in comparison with the acre yield of 17 to 23 bu. from winter wheats. Boswell winter oats have yielded very well in some seasons. In other seasons the yield has been low, thus reducing the average acre yield to 17.2 bu. for 1909 to 1912. However, the variety gives great promise as a winter oat for the intermountain region. The Black American, Giant Yellow, and Swedish Select varieties of spring oats have acre yields

of 15.2, 14.2, and 13.6 bu., respectively, in 1909 to 1912, inclusive. Two winter varieties of barley have given promising results. Of these 2, Utah Winter (C. I. No. 592) has yielded an average of 19.6 bu. per acre, as against 15.8 bu. for Tennessee Winter (C. I. No. 257). Three spring varieties were practically failures and were discarded in 1910. Black Winter emmer has shown itself adapted to conditions at Nephi, and probably will prove a valuable crop on the dry farms of the Mountain States. There was no apparent difference during 1912 between Buffum Improved Black Winter emmer (C. I. No. 3331) and the ordinary Black Winter emmer (C. I. No. 2337). . . .

"The following data obtained from the head rows are directly related to the results of the plat experiments: (1) The average winter survival of the cereals was about 65 per cent; (2) the tillering of the winter cereals varied with the thickness of the stand; (3) the average number of culms per plant in winter cereals seldom exceeded 25, though favored plants would sometimes have a greater number; (4) the average yields of the head rows gave the winter cereal varieties about the same rank as did the plat experiments; (5) the spring cereal varieties yielded less than the winter varieties, even though a better stand was obtained. . . .

"Some work has been done with grain sorghums, broom corn, millets, and prosos, but the results obtained have given little promise that these crops are adapted to the dry lands of the intermountain region.

"In the test of size of seed with both spring and winter varieties of wheat, the large seed was best in number of heads produced per plant and in yield per row. No great difference was observed among the different sizes of seed in the percentage of survival, plants maturing, or length of heads produced. In the test of different seed treatments for smut, the following points were observed: (1) The effect of the time of seeding on bunt depended largely on the season; (2) the best copper-sulphate treatment was 1 lb. of copper sulphate to 10 gal. of water, the seed soaked 10 minutes and dried; (3) the best formalin treatment was 2.5 parts of formalin to 1,000 parts of water, the seed soaked 10 minutes and kept moist 2 hours."

Prevention of lodging of cereals, ZIEHE (*Illus. Landw. Ztg.*, 32 (1912), No. 83, pp. 761, 762, figs. 3).—In a comparison with nitrogen and phosphorus, potash gave the best results in preventing lodging, due, it is believed, to the greater constitutional vigor of plants fertilized with this element.

The influence of moisture, fertilizer, and firmness of the soil on the root development of barley and wheat in early stages of growth, R. POLLE (*Über den Einfluss verschieden hohen Wassergehalts, verschiedener Düngung und Festigkeit des Bodens auf die Wurzelentwicklung des Weizens und der Gerste im ersten Vegetationsstadium. Inaug. Diss., Univ. Göttingen, 1910, pp. 84, pls. 2*).—The experiments here discussed were carried out in 2 sizes of pots of the Bücherhüllen form. Sixty-four pots had a height of 20 cm. and a width of 6 by 30 cm., and 32 were 40 cm. high and 6 by 20 cm. wide. Half of them were filled with clay soil and half with sandy soil. The low vessels each had 2 plants and the higher ones 1 plant each. To obtain more accurate results each treatment was repeated in 5 pots. Part of the pots were fertilized with $1/5$ gm. nitrogen as nitrate of soda, $1/5$ gm. P_2O_5 in $CaH_4(PO_3)_2$, and $1/5$ gm. K_2O in 40 per cent potassium salt, and the sandy soil received 0.5 gm. calcium carbonate in addition. In a part of the pots the soil was carefully and uniformly packed in the case of both sandy and clay soils, and in the remainder the 2 kinds of soils were left in a loose condition. The barley was planted on June 11 and harvested from June 21 to 26. The wheat was planted on July 14 and harvested from July 22 to 28. A unique method is described of securing the roots in a normal position by means of pressing a board, provided with numer-

ous long needles set at right angles to its surface, into the soil of the pot containing the roots after one side of the pot had been removed.

This study was planned to throw light on the influence of fertilizer, moisture, and firmness of soil, on the amount of root growth, the length of roots, and the weight of above-ground parts, and the ratio between the root mass and the above-ground parts, in respect to clay and sandy soils with barley and wheat.

A clay soil, fertilized, showed a less length of root system in a dry condition (11.25 per cent moisture content) than in a moist condition (19 per cent moisture content), but a greater weight of root growth, whether loose or hard packed, fertilized or not, with both barley and wheat. Root growth was generally greater in the loose clay with barley, but compaction was more favorable with wheat. With wheat, the unfertilized clay soil produced greater root growth than the fertilized without regard to the moisture or compaction of soil.

With a sandy soil the root development was generally greater without the fertilizers, regardless of the degree of moisture or firmness of soil, with both barley and wheat, while in the presence of other factors firmness favored root development. In general, a greater root system was produced in the case of barley in a dry (5.4 per cent moisture content) sandy soil, whether loose or firm, fertilized or not. A dry sandy soil produced a better root system with wheat in a loose condition than when compact, without regard to the fertilizer application.

In general, with both barley and wheat 1 gm. of roots produced a larger amount of above-ground parts in both clay and sandy soil when fertilized than when not fertilized, in a moist soil than in a dry soil, and in a compact than in a loose soil.

A study of the variations in chemical composition of the timothy and wheat plants during growth and ripening, L. D. HAIGH (*Orig. Commun.* 8. *Internat. Cong. Appl. Chem.* [Washington and New York], 26 (1912), *Septs. VIa-XIb, App., pp. 115-117*).—This is an abstract giving the results found with timothy at 7 stages of growth and with wheat at 4 stages.

"The timothy plant takes up its plant food, nitrogen, and ash constituents at the most rapid rate in the young stages. It continues at a decreasing rate to absorb plant food during growth and in about the same rate as this growth proceeds. The percentage of moisture in the green plant is also the highest in the young stages. The heads of timothy increase in dry matter throughout the growth and ripening period. This increase includes all the plant constituents except potassium oxid, which had reached its maximum amount before the heads were collected for analysis. . . . Nitrogen-free extract increases at the greatest rate of all constituents. As the heads approach full ripening a noticeable increase of phosphorus pentoxid occurs. The stalks of the timothy increase in dry matter during growth and ripening; this dry matter added consists chiefly of crude fiber and nitrogen-free extract. Nitrogen, ether soluble material, potassium oxid, and phosphorus pentoxid increase during growth but decrease to some extent during ripening. The bulbs increase in dry matter throughout the growth period, but the amount becomes constant before ripening of the hay. The material stored up is principally nitrogenous matter and nitrogen-free extract. No starch is produced in the bulbs during the storing process. Potassium oxid is found in maximum amount in the first stage but phosphorus pentoxid tends to increase in amount as the plant matures.

"Large amounts of available potash and phosphoric acid are required for a good yield of timothy. Timothy would hardly prove a profit-yielding crop on soils other than those rich in potash, especially where the mineral elements would have to be supplied in the form of fertilizer.

"The wheat plant also takes up its principal plant food, nitrogenous and mineral matter, at the greatest rate in the young stages and at a decreasing rate as growth proceeds. The highest percentage of moisture in the green plant is found in the first series. The heads of the wheat gain more uniformly and rapidly in their amount of dry matter than any other part. Nitrogen-free extract is produced and stored at a greater rate than any other constituent, but nitrogen, ash, and ether soluble matter are added in some quantity also. Fiber is practically all formed by the time the blossom has fallen and remains constant to ripening.

"The wheat stalks contain their maximum amount of dry matter at blossoming time, after which they pass some of this material along to the ripening heads. Nitrogenous substance and nitrogen-free extract appear to be the constituents which the stalks yield up to the heads. The wheat roots and stubble increase in dry matter up to the milk stage, after which it decreases in amount, being passed along to the plant above ground. Fiber present in the roots does not decrease in amount but nitrogenous and ether soluble material, ash, and nitrogen-free extract pass out of the roots into the growing plant above ground during the ripening of the heads."

[Fibers from Papua (British New Guinea) and India] (*Bul. Imp. Inst. [Soc. Kensington]*, 10 (1912), No. 2, pp. 214-219).—This report includes analyses and valuations of cotton, sisal hemp, Sida fiber, *Sida rhombifolia*, and Indian jute.

The use of sulphur in the cultivation of turnips and beets, A. MAGNIEN (*Jour. Soc. Nat. Hort. France*, 4. ser., 14 (1913), Jan., pp. 54-56).—Experiments are here cited, in which sulphur scattered in the row at the rate of 2 to 3 gm. per meter at planting time apparently doubled the yields.

Bean growing in eastern Washington and Oregon, and northern Idaho, L. W. FLUHARTY (*U. S. Dept. Agr. Farmers' Bul.* 561, pp. 12, figs. 5).—This describes cultural methods, with suggestions on marketing, uses, and improvement of the crop.

Field trials on the manuring of carrots, E. E. STOKES (*Midland Agr. and Dairy Col. Bul.* 5, 1912-13, pp. 38-45).—It is concluded that "farmyard manure may profitably be supplemented with chemical fertilizers; salt applied to the description of soils generally used for the production of carrots is beneficial, especially in a dry, hot season; potash in some form is absolutely necessary, especially when dung is not so largely used; phosphates come next in order of importance; and the addition of nitrogenous manures may be advisable to promote a good start and early growth."

Clovers, M. CALVINO (*Estac. Agr. Cent. [Mexico] Bol.* 69, 1912, pp. 92, pls. 44).—This bulletin treats of the climate, soil, rotations, inoculation, fertilizers, cultivation, harvests, and methods of conserving the crop and silage in relation to the clovers *Trifolium pratense*, *T. repens*, *T. alexandrinum*, *T. soaveolens*, *T. incarnatum*, and *T. hybridum*. Various methods of rotation in which clovers are used as green manures are described.

Crimson clover, A. E. GRANTHAM (*New Jersey Stas. Circ.* 28, pp. 4).—This gives suggestions and directions for growing the crop under New Jersey conditions.

Effect of frost on corn, J. B. LINDSEY (*Massachusetts Sta. Rpt.* 1912, pt. 2, pp. 67, 68).—Chemical analysis of frosted corn revealed little new, excepting that the fiber percentage seemed to be larger than is usually the case. "In case the corn is intended for the silo, the quicker the crop is ensiled the better. If the crop is not to be ensiled, it may be allowed to stand uncut for a week or two."

Seed selection of Egyptian cotton, T. H. KEARNEY (*U. S. Dept. Agr. Bul.* 38, pp. 8).—In this bulletin the author discusses the importance of keeping the

stock pure and describes methods that may be employed by breeders whereby the purity of the seed may be maintained. It is believed that but one variety of cotton should be grown in a locality, that careful roguing should be practiced, and that growers' associations should arrange for pure seed production.

Nine titles of Bureau of Plant Industry publications on this subject are appended.

Propagating cotton plants by slips, G. GASTET (*Rev. Hort. Algérie*, 6 (1912), No. 5, pp. 144-148, figs. 4; abs. in *Internat. Inst. Agr. [Rome]*, *Bul. Bur. Agr. Intel. and Plant Diseases*, 3 (1912), No. 10, pp. 2164, 2165).—A method by which herbaceous slips are pricked out in the hotbed or greenhouse is described in this article. The plants from which the slips are taken are removed from the field to the greenhouse late in the season, and profuse budding is induced.

Cowpeas for soil improvement, A. E. GRANTHAM (*New Jersey Stas. Circ.* 27, pp. 4).—This gives directions and suggestions for growing the crop under New Jersey conditions.

On the value of meadow foxtail grown on peat soils and the influence of the time of cutting, H. VON FEILITZEN, I. LUGNER and E. NYSTRÖM (*Svenska Mosskulturför. Tidskr.*, 27 (1913), No. 3, pp. 224-245).—Previously noted from another source (*E. S. R.*, 28, p. 834).

A variety test of potatoes, E. F. GASKILL (*Massachusetts Sta. Rpt.* 1912, pt. 2, pp. 11-16).—This paper contains brief notes on tests including 371 varieties during the past 18 years. The rate of yields ranged from 66 to 509 bu. per acre. It is noted that the majority of the new varieties are inferior to the old standard sorts, like Beauty of Hebron, Green Mountain, Early Rose, and Irish Cobbler, and that northern-grown seed was preferable to home-grown seed.

[Field crop experiments], G. T. MALTHOUSE (*Field Expts. Harper-Adams Agr. Col., and Staffordshire and Shropshire, Rpt.* 1912, pp. 17-19).—Results of variety tests of potatoes show yields as high as 6 tons 13½ cwt. per acre.

On the use of sulphur for the prevention of potato scab and as an indirect fertilizer, H. VON FEILITZEN (*K. Landtbr. Akad. Handl. och Tidskr.*, 52 (1913), No. 2, pp. 120-130).—Of the 5 varieties of potatoes experimented with during 1911, all but 1 yielded more on the plats receiving 400 kg. of sulphur per hectare (356 lbs. per acre) in addition to normal fertilizers than on those that did not receive sulphur, and the tubers were larger and better developed. Some improvements in regard to the appearance of scab were noted on these plats.

Trials with sulphur for horse beans and ray grass during 1912 are also reported. A bibliography on the subject of sulphur for plants is appended.

Lessons for American potato growers from German experiences, W. A. ORTON (*U. S. Dept. Agr. Bul.* 47, pp. 12).—The author discusses potato production as carried on in Germany, with special reference to conditions in this country.

It is noted that in Germany "the acreage is more than double that of the United States and the crop harvested more than 4 times our total. Of these potatoes 40 per cent are fed to stock, 28 per cent are used for table purposes, 12 per cent for seed, 6 per cent for alcohol, 4 per cent for starch and related products, and 10 per cent decay. The per capita consumption for food is 7.3 bu. per year in Germany, as compared with an estimate of 2.6 bu. in the United States. . . .

"We must hereafter produce enough potatoes to supply all our needs, as most sources of foreign imports have been closed by a plant-disease quarantine. To do this economically we should find a profitable outlet for a surplus production, . . . The most promising use for culls and surplus potatoes appears to be

in feeding hogs. There are possibilities in starch and alcohol and some hope of adapting the method of drying now used in Germany."

Beet sugar in New England, J. B. LINDSEY (*Massachusetts Sta. Rpt. 1912, pt. 2, pp. 69, 70*).—The author briefly reviews attempts to introduce sugar-beet culture in Massachusetts, and concludes "that while the climate is satisfactory and a considerable area is suited to the beet, economic conditions are not favorable to the production of beet sugar in Massachusetts."

Sugar-cane experiments, J. B. HARRISON and R. WARD (*Jour. Bd. Agr. Brit. Guiana, 6 (1913), No. 3, pp. 123-126*).—In a test with molasses as a fertilizer for sugar cane, only a slight increase could be detected from applications of 100, 200, and 300 gal. per acre. Partially sterilizing the soil of experimental plats with chlorinated lime applied at the rate of 150 lbs. per acre apparently gave slightly increased yields of cane over untreated plats.

Classification of the forms of *Helianthus annuus*, T. SAZYPEROW (*Trudy Bûro Prikl. Bot. (Bul. Angew. Bot.), 6 (1913), No. 2, pp. 95-110, figs. 3*).—Four forms are mentioned, viz, common, white, black, and armored sunflower. The last-named has a subepidermal layer of parenchyma cells which seem to be especially useful as a protection against the attacks of disease.

Research work at Harrow Experimental Station, 1911, W. A. BARNET (*Canada Dept. Agr., Tobacco Div. Bul. A14, 1912, pp. 20, pls. 2*).—This bulletin reports experiments in which different kinds of seed beds were established for tobacco.

The conditions point to the advisability of making up the bed 10 days before sowing, which was done at the rate of 1 teaspoonful (1/7 oz.) of seed to 70 sq. ft. To hasten the growth of seedlings a stock solution of 1/4 lb. of nitrate of soda to 2 gal. of water was made, one pint of which was diluted with 10 qt. of water for application.

Tests in curing in small and large kilns and fertilizer tests with bright tobacco were carried on. In a comparison between the bright tobacco and Burley, the Burley proved the more profitable. A description of a new curing barn is given.

Tobacco culture, G. N. BLACKSHAW (*Rhodesia Agr. Jour., 10 (1912), No. 1, pp. 56-66, pls. 5*).—In this article methods of preparing the soil are given, these including the burning of the soil to a depth of 1/2 in. As a remedy for cutworms a poison is suggested which consists of 1 lb. arsenite of soda, 8 lbs. brown sugar, and 10 gal. of water; this is to be mixed with green stuff or corn meal and distributed over the ground a few days before the tobacco is transplanted. Broadcasting or drilling the fertilizer in the soil before the plants are set is advised, as compared with top-dressing later.

Suggestions for gathering and storing the seed and directions for growing, curing, storing, and baling Turkish tobacco are given.

Cultivation of tobacco for the preparation of fruit and hop washes (*Jour. Bd. Agr. [London], 19 (1913), No. 12, pp. 985-994*).—This article discusses the difference between smoking tobacco and that used for the extraction of nicotin. It is stated that the latter should be of rank, coarse-growing varieties unfit for smoking purposes. Methods of cultivating, fertilizing, harvesting, extracting, and preparing the washes are discussed. The cost and returns per acre are given. In Kent in 1911 yields of over 2,000 lbs. of dry leaves, with over 150 lbs. of nicotin, per acre were obtained.

A cross between *Triticum vulgare* and *T. monococcum*, N. WAWILOFF (*Trudy Bûro Prikl. Bot. (Bul. Angew. Bot.), 6 (1913), No. 1, pp. 1-19, pl. 1, fig. 1*).—The chief characteristics of this cross were observed to have been lateness in ripening and sterility.

Wheat growing in Wisconsin, E. J. DELWICHE and B. D. LEITH (*Wisconsin Sta. Bul.* 233, pp. 3-22, figs. 8).—This bulletin outlines briefly the present status of wheat growing in Wisconsin, and includes reports on results of experiments which for six successive seasons have been carried on at the station at Madison and at the substations in the different sections of the State. In this connection are discussed the cause of the decline in wheat growing in Wisconsin, the present outlook, and wheat and soil depletion. Under essentials of wheat culture are discussed rotations, soil preparation, good seed, time and manner of seeding, harvesting and threshing, and spring and winter wheat.

Tabulated data of variety tests of both winter and spring wheats are given, including nearly 30 selections. In general, winter wheat outyielded spring wheat.

Some variable results of seed testing, G. E. STONE (*Massachusetts Sta. Rpt.* 1912, pt. 2, pp. 22-30).—This paper gives results of purity and germination tests made at about 20 different seed-testing stations of seed taken from the same bulk, and discusses the difficulties underlying the identification of seeds. The seeds used were red clover, timothy, Kentucky blue grass, orchard grass, millet, and alfalfa. Wide variations were obtained from the various stations. The germination of Kentucky blue grass was reported at from 3 to 88 per cent, and orchard grass showed a range of 45 per cent.

Seed work for the year 1912, G. E. STONE (*Massachusetts Sta. Rpt.* 1912, pt. 2, pp. 17-21).—This gives results with 285 samples for germination and 82 samples for purity tests. A total of 1,517 lbs. seed was separated. The seeds tested for purity were of unusually high grade.

"Yellow rattle," as a weed on arable land, WINIFRED E. BRENCHEY (*Jour. Bd. Agr.* [London], 19 (1913), No. 12, pp. 1005-1009, figs. 2).—Two distinct species of this parasite are noted, *Rhinanthus minor* and *R. major*. Their life history, means of attaching to cultivated crops, especially grasses and cereals, and the method of combating, which consists chiefly of fallow cultivation for a season, are discussed.

HORTICULTURE.

Intensive farming, L. C. CORBETT (*New York, 1913, pp. 146+IV, pls. 8, figs. 3*).—This comprises a popular handbook of information on the fundamental practices employed in various types of intensive farming. The subject matter is discussed under the following general headings: The problem, vegetable growing, onions, celery, frame culture, the vegetable forcing industry, fruit growing, small fruits, the citrus industry, plant breeding as a factor in intensive farming, seed growing, the nursery an example of intensive crop production, irrigation, animal industry, economics of intensive industries, and the cropping system as a unit.

Recent progress in Belgian horticulture, VERNIEUWE (*Internat. Inst. Agr.* [Rome], *Mo. Bul. Agr. Intel. and Plant Diseases*, 4 (1913), No. 9, pp. 1321-1326).—In this paper the author briefly reviews the recent developments in Belgian horticulture, including the measures employed to maintain and safeguard the interests of the horticultural industry.

Malnutrition or overfertilization of greenhouse crops, H. D. HASKINS (*Massachusetts Sta. Rpt.* 1912, pt. 2, pp. 71-79).—An analytic study of greenhouse soils in which cucumbers and sweet peas made sickly growth leads the author to conclude that imperfect growth and development were due in these cases, as well as in many other cases where plant growth is unsatisfactory, to an annual accumulation of soluble plant food rather than to fungi and bacteria. With cucumbers the trouble does not usually develop until the third year

after the soil has been placed in the houses. The plants which at first are usually very vigorous turn yellow prematurely and fail to develop fruit.

The author emphasizes the importance of good drainage in greenhouse beds and benches. Wherever indications of overfertilization appear the soil should be leached out with hot water as soon as the crop is removed. The crop may sometimes be saved by applying about 3 in. of fresh loam to the surface of the bed and working lightly around the plants. This promotes the formation of new roots. After the removal of the crop from one-third to one-half of the soil in the benches should be replaced with new loam before replanting.

The influence of various light intensities and soil moisture on the growth of cucumbers, and their susceptibility to burning from hydrocyanic acid gas, G. E. STONE (*Massachusetts Sta. Rpt. 1912, pt. 1, pp. 61-72, pl. 1*).—The experiments here reported were conducted at the station by F. L. Thomas with cucumber plants which were grown in the greenhouse under varying light and soil moisture conditions alongside plants growing under normal conditions. After the plants had reached a certain degree of development they were all submitted to the same normal hydrocyanic acid gas fumigation.

Summarizing the data relative to light conditions, the greatest average height of the plants and length of internodes were found in the series where the light was less, while, on the other hand, the shortest internodes and greatest diameter of the stems occurred in those plants which received the most light. The average length and width of leaf was variable but the plants grown where the light was excluded had the largest leaves. It is suggested that the production of larger leaves under certain light intensities is apparently a response to a demand for greater carbon assimilation. In the soil moisture experiments the average height of the plants was greater and the leaves larger in the pots containing the largest percentage of water. Within certain limits the diameter of the stems and length of the leaf petioles and internodes was also greater in the plants growing in a higher percentage of soil moisture; in pots containing as high as 70 per cent of water there was too much water for the best development.

Burning from hydrocyanic acid gas was more extensive on plants grown under a poor light and excessive moisture conditions than where the light and moisture conditions were good, showing that burning by fumigation is induced by a difference in the development of the tissues whether brought about by inferior light conditions or excessive moisture. Further experiments are being conducted to throw more light on the influence of other factors on burning.

Some effects of fertilizers on the growth and composition of asparagus roots, F. W. MORSE (*Massachusetts Sta. Rpt. 1912, pt. 1, pp. 154-167*).—The experiments here reported have been noted from another source (*E. S. R.*, 28, p. 236).

The inheritance of blossom color in beans, J. K. SHAW (*Massachusetts Sta. Rpt. 1912, pt. 1, pp. 182-203, pl. 1*).—The author here presents and discusses a series of tables which show the inheritance of blossom color in various combinations of some 19 varieties of garden beans, the progeny from the crosses having been self-fertilized through four generations. An interpretation of the results relative to blossom color is to be made later through an analysis of the records of the inheritance of seed-coat color.

Report of cranberry substation for 1912, H. J. FRANKLIN (*Massachusetts Sta. Rpt. 1912, pt. 1, pp. 209-234*).—A progress report on the experiments conducted and observations made at the cranberry substation during the year (*E. S. R.*, 28, p. 341). The subject matter is discussed under the following general headings: Weather observations, frost protection, fungus diseases, varieties, blossom pollination, fertilizers, insects (see p. 154), and miscellaneous.

Progress in determining the local conditions which indicate frost is reported, the season's records indicating that the early evening dew point can be relied upon to a considerable extent in forecasting minimum temperatures on the bogs. The use of oil heaters was found to be effective as protection against frost, but was too expensive to be practicable.

In the work with fungus diseases being conducted in cooperation with the U. S. Department of Agriculture five plats each 4 rods square received two sprayings of Bordeaux mixture and one of neutral copper acetate. Two lbs. of resin fish-oil soap were used with the Bordeaux in all cases and with the acetate. As compared with the check plats increased yields of from 45 to 144 per cent were secured on the sprayed plats. During the previous year the sprayed plats showed no increase in quantity of fruit over their checks, hence it is suggested that the effects of annual spraying may be cumulative. When the fruit was gathered no distinct difference in color between the berries from the sprayed plats and their checks was observed, but differences in the size of the berries appeared to be influenced by the time of picking. In early picked fruit the berries on the check plats were larger, whereas in the last pickings the berries on the sprayed plats were larger. It is suggested that this was due to a retardation in the development of the fruit on the sprayed vines due to the heavier crop which they were producing. The keeping quality was improved by spraying, although this was more marked with the Howe variety. This and the distinctly greater increase in quantity of fruit on the Howe plats indicate the presence of a special diseased condition affecting that variety more seriously than the others. This disease, hitherto undetermined, has been tentatively called "blossom end rot." Its characteristic effect on the fruit is to cause it to rot, beginning at the blossom end and working gradually toward the stem end, the berry becoming soft, but remaining plump and watery, as the decay progresses. The tests appeared to give no evidence that the stage of ripeness at which the berries were picked had any effect on their keeping quality. Observations made during the past two years seem to indicate that resanding favors fungus diseases and that spring sanding favors fungus development more than does fall sanding.

The pollination experiments as continued on another part of the bog (E. S. R., 26, p. 841) appeared to contradict partially the results previously secured, inasmuch as the area over which the bees were excluded bore at least half a crop of berries. The experiment is to be repeated.

Observations made during the year indicate that the berries of a heavy cranberry crop will, other conditions being equal, keep better than those of a light crop, and that the surface roughening of the fruit in certain varieties may be relied upon to some extent as an indicator of their keeping quality.

The results of storage tests which were carried out with berries from all the fertilizer plats gave no evidence that any of the fertilizers, except perhaps the acid phosphate, had affected the keeping quality. Nitrate of soda had a marked effect in increasing the quantity of fruit, although the variation in size between the berries from the different plats was not very great. Potash caused no increase in fruit and the phosphate but very little. If lime had any effect, it was detrimental. The vines on the plats to which nitrate was applied made a more luxuriant but desirable growth than those on the rest of the bog.

New varieties of fruits, A. NOMBLOT (*IV. Conf. Internat. Génétique Paris, Compt. Rend. et Raps., 1911, pp. 464-468*).—With the view of procuring new varieties of tree fruits sowings of seed from different varieties were made a number of years ago. Consideration is here given to those forms which have arisen from naturally fertilized fruits.

The results with the cherry have shown that certain types, as the Bigarreau, Morello, Black Heart, etc., possess some degree of fixity. The Mirabelle and Green Gage plums and a number of peaches have also proved to be relatively fixed. In the case of apples and pears many forms varying in their vegetative characters and not resembling the maternal parent have been obtained.

The author is not inclined to favor grafting as a means of hastening the fruiting period of seedling trees since this method has not given conclusive results. Moreover, he does not favor the propagation of varieties by the use of immature wood.

Crew work, costs, and returns in commercial orcharding in West Virginia, J. H. ARNOLD (*U. S. Dept. Agr. Bul. 29, pp. 24, figs. 5*).—In this bulletin the author summarizes and analyzes the experiences in orchard management of different individuals who have been pioneers in the development of the peach industry in the drainage basin of the Potomac River in West Virginia. Practically every factor involved in peach growing is considered with special reference to the determination of costs.

From an analysis of the data secured the author comes to the general conclusion that with the most favorable conditions that can be reasonably expected and under the most skillful and experienced management, average dividends of over 25 per cent are practically impossible. At the average price of 65 cts. per basket a good manager might reasonably expect to pay 10 per cent dividends on the money invested.

Cultivation and exploitation of the avocado, G. R. VALENCIA (*Estac. Agr. Cent. [Mexico] Bol. 71, 1912, pp. 70, pls. 20*).—A popular treatise on the botany, culture, exploitation, and uses of the avocado.

Mulberry and fig culture, M. CALVINO (*Estac. Agr. Cent. [Mexico] Bol. 73, 1912, pp. 33, pls. 8*).—A popular cultural treatise with special reference to Mexican conditions.

On some hybrids of *Vitis vinifera* and *V. berlandieri*, GARD (*IV. Conf. Internat. Génétique Paris, Compt. Rend. et Raps., 1911, pp. 395, 396*).—In studying a number of hybrid forms of *V. berlandieri* × *V. vinifera* raised from seed of *V. berlandieri* it was observed with regard to the stem that the hairy character of the maternal parent and also the glabrous character of most varieties of *V. vinifera* occurred among the hybrids, together with a large number of intermediate forms. Transverse sections of the stem show that the structure is sometimes intermediate between the two parents and sometimes nearer that of *V. vinifera*. Most generally certain characters of the liber and of the secondary wood, and especially those of the primary wood, are nearer *V. vinifera*. In the roots, on the other hand, these characters are nearer the other parent and are in accordance with the power of resistance to phylloxera and the excellent qualities as stocks possessed by these hybrids.

On the use of seedling vines as scions, TRABUT (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 34 (1913), No. 46, pp. 625, 626, figs. 2*).—The author here calls attention to some successful results secured during the past season in cleft grafting grape seedlings on green shoots of old vines. At the beginning of June young plants which had only their cotyledons were trimmed like ordinary scions and inserted on the top of green shoots. The end of the shoot was wrapped with a small band of paraffin paper secured with raffia. The completed graft was then covered with a small paraffined paper bag in order to preserve the humidity. The parts united in about 2 weeks' time after which the young plants grew vigorously. By October the union was hardly visible and the shoot was about 3 meters long.

The application of this method for the rapid propagation of new varieties is suggested.

The reconstruction of vineyards without grafting, C. OBERLIN (*Weinbau u. Weinhandel*, 31 (1913), Nos. 28, pp. 287, 288; 29, p. 297; 30, pp. 307, 308; 31, pp. 317, 318; 32, pp. 327, 328; 33, pp. 337, 338; 34, p. 347).—After a general survey of the results secured in reconstituting phylloxera infested vineyards in Europe the author concludes in substance that, although the use of American grape stocks may be the best means of reconstituting the vineyards in the warmer parts of Europe, the use of grafted vines is too costly and complicated a process for cold climate regions such as Alsace-Lorraine, where it is necessary to plant the grape sufficiently deep to protect the grafts from frosts. He calls attention to the relative resistance of grapes grown by the cordon system to phylloxera as compared with grapes grown on individual stakes, as well as the greater ease with which cultural and spraying treatments may be given. With special reference to the industry in Alsace-Lorraine he suggests that the double arm cordon system be adopted and attention also given to the testing of direct-bearing American-European hybrids which are much more frost resistant than the grafted stocks.

Some new or little-known Philippine economics, O. W. BARRETT (*Philippine Agr. Rev. [English Ed.]*, 6 (1913), No. 10, pp. 493-503, pls. 10).—Brief descriptions are given of a large number of native fruits and plants of more or less economic importance.

The Kafir orange, D. FAIRCHILD (*Amer. Breeders Mag.*, 4 (1913), No. 3, pp. 148-153, figs. 2).—Attention is here called to the Kafir orange (*Strychnos spinosa*), an edible member of the strychnin producing genus which has been successfully grown in Florida and southern California. Notes are also given on other species of this genus which promise to succeed in our semitropical regions and which with a little improvement through hybridization and selection may offer a number of unique fruits to American growers.

American medicinal flowers, fruits, and seeds, ALICE HENKEL (*U. S. Dept. Agr. Bul.* 26, pp. 16, figs. 12).—This bulletin describes the following 13 plants, the flowers, fruits, or seeds of which are in greatest demand for medicinal purposes: Juniper (*Juniperus communis*), saw palmetto (*Serenoa serrulata*), wormseed (*Chenopodium anthelminticum*), pokeweed (*Phytolacca americana*), black mustard (*Brassica nigra*), white mustard (*Sinapis alba*), raspberries (*Rubus occidentalis* and *R. strigosus*), prickly ash (*Zanthoxylum americanum* and *Z. clava-herculis*), smooth sumac (*Rhus glabra*), American linden (*Tilia americana*), poison hemlock (*Conium maculatum*), jimson weed (*Datura stramonium*), mullein (*Verbascum thapsus*), and elder (*Sambucus canadensis*).

Each plant is discussed with reference to its synonymy, habitat and range, description, collection, uses, and prices. Brief suggestions are given relative to the collection of flowers, fruits, and seeds.

Experiments in bulb growing at the United States Bulb Garden at Bellingham, P. H. DORSETT (*U. S. Dept. Agr. Bul.* 28, pp. 21, figs. 21).—In 1903 the Bureau of Plant Industry established an experimental bulb garden at Bellingham, Wash., to determine the feasibility of growing the so-called "Dutch bulbs," including hyacinths, narcissuses, and tulips in the United States. This bulletin reports the progress and present status of the work, including the cultural practices thus far employed.

Generally speaking the results have been satisfactory, a high grade of bulbs having been produced. On the other hand, the Department is not prepared to recommend the commercial culture of "Dutch bulbs" in this country until further information is gained relative to climatic and soil requirements, cultural practices, and methods of harvesting, curing, storing, transporting, and marketing the crop.

Weed extermination, G. E. STONE (*Massachusetts Sta. Rpt. 1912, pt. 2, pp. 35-40, pls. 3*).—In this article the author discusses different methods of exterminating weeds from lawns. Descriptions of devices for applying arsenate of soda, cutting weeds, and spreading fertilizer are included.

Legislation against the diseases and pests of cultivated plants in Ceylon, T. PETCH (*Dept. Agr. Ceylon Bul. 6, 1913, pp. 79-93*).—This bulletin contains the text of regulations which have been issued in Ceylon under ordinances enacted for the control of native diseases and pests and for preventing the introduction of others.

FORESTRY.

Forest valuation, F. RIEBEL (*Waldwertrechnung. Vienna and Leipsic, 1912, 2. ed., rev. and enl., pp. XVI+527, pls. 2*).—Part 1 of this work comprises a theoretical discussion of various factors which enter into the determination of the money value of a forest or a forest enterprise, consideration being given to the general economic, forest economic, and mathematical fundamental principles of forestry, and to the various methods of forest valuation. In part 2 the application of the theoretical knowledge relative to forest valuation to existing cases is illustrated by numerous examples.

An economic study of acacias, C. H. SHINN (*U. S. Dept. Agr. Bul. 9, pp. 38, pls. 11*).—In this bulletin the author discusses the economic importance of the leading acacias in various countries with the idea of bringing about more general planting in suitable regions in this country.

A study of the cultural requirements of the many species of acacia which have been grown as ornamentals in this country, chiefly in California, leads to the general conclusion that plantations properly located and managed are as likely to prosper in America as in other countries, where the various species have been a valuable source of tanbark, gums, timber, etc. Attention is called to the fact, however, that thus far our knowledge relative to the success of acacias in this country is chiefly of a cultural nature. It is yet to be determined whether the trees can be produced under close-planted commercial conditions and whether the products can be harvested and marketed in competition with those produced cheaply abroad.

Manihot caoutchouc, A. ZIMMERMANN (*Der Manihot-Kautschuk. Jena, 1913, pp. XI+342, figs. 151*).—A treatise on the culture, exploitation, and preparation of the various Manihot rubbers. Other rubber-yielding species are considered in as far as the practices employed in handling them are of value for the culture of the Manihot species. The subject matter is based partially on a review of the literature of the subject and partially upon observations made in German East Africa, as well as on the author's personal investigations.

An extensive bibliography of the subject is appended.

Device for planting white pine seed, G. E. STONE (*Massachusetts Sta. Rpt. 1912, pt. 2, pp. 31, 32, pl. 1*).—The device here described consists of a hollow iron tube about $\frac{5}{8}$ in. in diameter at the top of which is a funnel and to the bottom of which is attached a bent piece of strap iron about $1\frac{3}{4}$ in. in width and thick enough to give the required rigidity. This is sharpened at the end like a chisel. The hollow handle is extended by means of a rubber tube so that when the blade is thrust into the ground the opening comes over the hole which is made when the handle is brought to a vertical position. The seed is planted by dropping it into the funnel at the top of the handle.

Condition of experimental telegraph poles, treated and untreated, after eight years' service, C. H. TEESDALE (*Engin. News, 70 (1913), No. 22, pp. 1084-1086, figs. 4*).—The work here reported was started in the summer of 1905,

when a large number of treated and untreated chestnut and white cedar poles were set up in experimental lines in cooperation with the American Telegraph and Telephone Company. The previous results of this test have been noted (E. S. R., 25, p. 344). In the present report an outline is given of the experimental treatments, together with the results secured after a test of 8 years.

As a result of this experiment it appears that the average life of the untreated seasoned and green southern white cedar poles in this line will not exceed 7 to 8 years. Seasoned poles set untreated showed a larger percentage of removals than the green poles. This is attributed to the length of time the seasoned poles were held before they were set. The chestnut poles were found to be in a much better condition than the cedar. Some 63 per cent of the untreated poles were still only slightly decayed, while of the treated poles, excluding tar coating, 91 per cent were either sound or only slightly decayed. Good results were obtained with all preservatives, except tar. Coal-tar products gave better results than wood-tar products. The results obtained with the carbolineums were only slightly better than with coal-tar creosote. The southern white cedar poles brush-treated with good preservatives showed less decay than untreated chestnut poles but were decayed more than the treated chestnut poles. Fewer removals and fewer badly decayed poles were found in the portions of the line running through swamps and wet locations than in dryer situations. The worst conditions were found in cultivated fields and dry sandy situations.

The author concludes that, although brush treatments with a good preservative gave an increased life to poles sufficient to pay well for the cost of treatment, to be really effective the application should be sufficient to treat all the sapwood and in the case of chestnut probably some of the heartwood.

DISEASES OF PLANTS.

An outline of some of the topics covered by the department of vegetable physiology and pathology since its inception, G. E. STONE (*Massachusetts Sta. Rpt. 1912, pt. 1, pp. 97-101*).—A bibliography of the more important papers published by the department since 1888 is given.

Diseases more or less common during the year, G. E. STONE (*Massachusetts Sta. Rpt. 1912, pt. 1, pp. 38-40*).—Brief notes are given on winterkilling of twigs and roots of apple trees and the occurrence of scab (*Fusicladium dendriticum*), apple fruit rots, bitter rot (*Glucosporium fructigenum*), and of white pine blister rust on currants. A large number of other diseases due to parasitic fungi are listed. In addition notes are given on some forest and shade tree troubles, among them a mottling of chestnut leaves, the killing back of twigs of elm, maple, ash, butternut, Norway spruce, and sycamore, root diseases of elm, maple, and oak, as well as winter injury to other species. It is stated that the winter of 1912 was one of the worst on record for the depth of freezing and that vegetation in general was in poor condition owing to drought.

Work of the botanical research laboratory and of the laboratory for plant diseases at Klosterneuburg, L. LINSBAUER, J. K. SCHECHNER, and F. ZWEIFELT (*Programm u. Jahresber. K. K. Höh. Lehranst. Wein u. Obstbau Klosterneuburg, 1911-12, pp. 141-166, figs. 6; Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 4 (1913), No. 7, pp. 1114, 1115*).—The first article noted herein is the regular report regarding observations made on various diseases of orchard and small fruits, grapes, vegetables, etc., and of studies on some physiological problems, a list of addresses and publications being appended. The second article noted is a short and more specific account, by Linsbauer, of some physiological investigations bearing upon the development and some

physiological aspects of certain grape diseases, including *Plasmopara*, *Pseudopeziza tracheiphila*, and "Droah."

Studies of plant diseases, H. C. MÜLLER, E. MOLZ, and D. MORGENTHAUER (*Ber. Agr. Chem. Kontroll u. Vers. Stat. Pflanzenkrank. Prov. Sachsen., 1912*, pp. 67-76).—This is a condensed report on studies carried out on various diseases of grains, beets, potatoes, fruit trees, and garden vegetables, with a list of remedies and apparatus for their application tested and approved by the station.

Notes on *Cronartium coleosporioides* and *C. filamentosum*, E. P. MEINECKE (*Phytopathology, 3 (1913), No. 3, pp. 167, 168*).—The author reports the successful infection of *Castilleja miniata* with aecidiospores of *Peridermium stactiforme* from *Pinus contorta*.

Mosaic and allied diseases, with especial reference to tobacco and tomatoes, G. H. CHAPMAN (*Massachusetts Sta. Rpt. 1912, pt. 2, pp. 41-51*).—A report is given of observations on this disease of tobacco and tomatoes which the author says he has been able to produce on other plants, such as ragweed, jimson weed, etc.

The disease is held to be of physiological origin and is caused by the excessive activity of the oxidase and peroxidase enzymes in the plant and the partial loss of function of catalase. It is not considered due to any one enzyme alone nor to any special virus. It is infectious but not contagious, and does not occur in seed beds when new soil is used nor in properly sterilized seed beds.

Directions are given for the handling of the seed beds, the use of fertilizers, the choice of soils, etc., to reduce as much as possible the occurrence of this trouble. A bibliography is appended.

Cucumber and tomato canker (*Gard. Chron., 3. ser., 54 (1913), No. 1393, pp. 167, 168, fig. 1*).—This disease, due to *Mycosphaerella citrullina*, the same fungus which attacks muskmelons in the United States (E. S. R., 21, p. 148), is said to be widely spread in Great Britain, where it is causing considerable loss to tomatoes and cucumbers grown under glass, and it has recently been shown to occur on fruits of tomatoes grown in the open (E. S. R., 29, p. 847).

The fungus appears to be a wound parasite and is spread most rapidly by the pycnidiospores. On the tomato the symptoms which have been most frequently seen are the wilting of the whole or top part of the plant, and the appearance of brown sunken areas on some parts of the stem. These are generally within 1 or 2 in. of the soil, although in some instances the canker may be found farther up the stem.

Comparatively little is known regarding methods of prevention, but attention to the proper temperature and humidity of the houses and spraying with Bordeaux mixture, it is thought, would tend to prevent the serious occurrence of the trouble.

White-heads or take-all of wheat and oats (*Bd. Agr. and Fisheries [London], Leaflet 273, 1913, pp. 4, fig. 1*).—A brief description of this disease, *Ophiobolus graminis*, in its different aspects is given with a discussion of its prevalence, mode of attack, and prevention. It is said to flourish also on couch grass, *Bromus sterilis*, etc., requiring their suppression or control; likewise it is said to attack oats, rendering this crop unfit for rotation as a means of starving out the fungus. Blindness or abortion of the grain in the ear may be due to other causes named, but such cases may be recognized by the absence of the characteristic blackening at the base of the stem.

It is claimed that superphosphate of lime at the rate of 1½ cwt. per acre applied when the crop is young proved effective at Kew, and that in Australia iron sulphate at the rate of 1 cwt. per acre checked this disease.

The barberry and its relation to black rust of grain, H. T. GÜSSOW (*Phytopathology*, 3 (1913), No. 3, pp. 178, 179).—Attention is called to a report on the disappearance of *Puccinia graminis* in Denmark following the application of the law relating to the destruction of barberries.

The action of different luminous radiations on the formation of conidia on Botrytis cinerea, F. and MME. F. MOREAU (*Bul. Soc. Bot. France*, 60 (1913), No. 2-3, pp. 80-83).—The authors, studying the development of *B. cinerea* on carrot under a pure strong spectrum, found that conidia were formed under these circumstances only in the violet-blue portion of the spectrum. This result agreed with that obtained by Reidemeister (E. S. R., 23, p. 48), but disagreed with that reported by some other authors named.

A bacterial rot of cucumbers, O. F. BURGER (*Phytopathology*, 3 (1913), No. 3, pp. 169, 170).—A brief report is given of two years' investigations of a bacterial disease of the leaves and fruit of cucumbers.

On the fruit watery spots with brown centers appear, and later the cucumbers become soft and translucent. The first indication of infection on the leaves is shown by the presence of watery spots. Cultures made from the material showed the presence of a bacterium, and inoculation experiments demonstrated that this organism was the cause of the trouble.

Vines were reported as drying up without setting fruit, and this led to inoculation experiments on healthy flowers. These were found to turn yellow, blacken, and dry up without developing any fruit.

The cultural characteristics of the organism, which is a species of *Pseudomonas*, are being investigated further.

Corynespora leaf spot of cucumbers, W. GROSSER (*Illus. Schles. Monatschr. Obst. Gemüse u. Gartenbau*, 2 (1913), No. 8, p. 137).—A discussion is given of a disease of cucumbers said to cause great damage in England, but heretofore only sporadic in Germany, and attributed to *C. mazei*.

In the absence of complete investigations as regards efficient and inexpensive means of control, the author recommends soaking the seed 4 hours in 0.5 per cent formalin solution before planting, also spraying the plant with 0.4 per cent Bordeaux mixture, as preventive measures. No remedy is offered as effective after the general outbreak of the disease.

Fusarium or Verticillium on okra in North Carolina? G. W. WILSON (*Phytopathology*, 3 (1913), No. 3, pp. 183-185).—In a previous publication (E. S. R., 26, p. 844), a disease of okra attributed to *F. vasinfectum* was described. Later the identity of the fungus had been questioned, and the author reports somewhat more in detail upon the disease and its causal organism. The studies are said to show that the fungus was not a *Verticillium* but a *Fusarium*, as previously reported.

Black heart of potatoes, E. T. BARTHOLOMEW (*Phytopathology*, 3 (1913), No. 3, pp. 180-182, pl. 1).—The attention of the department of plant pathology of the Wisconsin Station has been called to a blackening of the tissues of potatoes. An examination of these tissues showed them to be sterile. Following this a laboratory experiment was conducted, and it was found possible to produce the condition if potatoes were taken from the storage cellar and exposed to a temperature of from 38 to 45° C. (98.4 to 113° F.) for from 18 to 48 hours. The blackening did not develop to the same extent in all the potatoes. The change apparently begins in the center and radiates toward the margin, and if the abnormal potatoes are allowed to remain 10 days or 2 weeks before cutting, the blackened tissues in the center shrink, leaving a hollow with a black lining.

Further studies are being made on the physiological changes which cause the blackening, and for the present attention is directed to the disease and the importance of keeping potatoes at a uniformly low temperature.

Experiments relating to the control of potato scab, G. E. STONE and G. H. CHAPMAN (*Massachusetts Sta. Rpt. 1912, pt. 1, pp. 84-96, pl. 1*).—The results of experiments with various chemicals for the prevention of potato scab are given. These experiments were begun in 1908 and continued for 4 years, different substances being employed. The potatoes were grown in soil in tiles 23 in. in diameter, and the treatment consisted of sterilization and the use of formalin, potassium permanganate, sulphuric acid, sulphur, copper sulphate, carbon bisulphid, a commercial by-product called by the author "by-product A," etc.

Summarizing the results of the experiments, it is shown that many of the substances used had little effect in preventing scab, while others seemed to possess some value. Steaming the soil seemed to have but little effect on the production of scab. The best results were obtained by the use of by-product A in dry form, followed by sulphur treatment and by-product A in solution and steam heating. The by-product seems to act slowly and continuously as a germicide, and it is thought that it may prove efficient in the control of other fungi.

The relation of cane cultivation to the control of fungus diseases, J. R. JOHNSTON (*Porto Rico Sugar Producers' Sta. Circ. 3 (English Ed.), pp. 13*).—The author describes the various cultural methods that have been tested for growing cane, and points out methods to be adopted for the control of fungus diseases so far as any relation exists between them and the agricultural practices.

The black rots of the sweet potato, J. J. TAUBENHAUS (*Phytopathology, 3 (1913), No. 3, pp. 159-166, pls. 3*).—A study of the black rot of the sweet potato, described by Halsted (*E. S. R., 2, p. 416*) and since attributed to *Sphæronema fimbriatum*, has been made, and the author has come to the conclusion that the disease is not due to this species, but is a sclerotium fungus, to which the name *Sclerotium bataticola* n. sp. is given. In order to distinguish this disease from the black rot caused by *Trichoderma köningi*, it is proposed to call it the charcoal rot of the sweet potato.

A third black rot of the sweet potato is described, which is said to be due to *Lasiodiplodia tubericola*. For this the author proposes the name Java black rot, as this indicates the source from which the disease was first obtained.

Study of recent diseases of grapevines, their importance and treatment, V. C. M. DE ZÚÑIGA (*Estac. Enol. Haro Mem., 1912, pp. 85-98*).—Giving the results of several years' study of arrepollao or achaparrado (court-noué) of grapevines in the Rioja, Spain, the author states that this trouble although not very serious at present is more frequently met with on lowlands and levels and in valley bottoms than in higher portions of the valleys and on benches. Clayey, cold, compact soils appear to favor court-noué more than do loose stony or slaty soils, the percentage of moisture seeming to bear some relation to its appearance as do also abrupt temperature changes in winter and spring. Considerable differences are noted in the susceptibility of different varieties, Riparia and Berlandieri proving relatively resistant. It is thought also that vigorous growth in autumn tends to decrease the likelihood of this trouble in spring.

Downy mildew in Vaucluse in 1913, E. ZACHAREWICZ (*Rev. Vit., 40 (1913), No. 1025, pp. 171-174*).—Three outbreaks of downy mildew were noted in the Department of Vaucluse in 1913. Both copper sulphate mixed with powdered soap to the amount of 1.5 per cent each in water, and a mixture of 70 parts of sulphur with 30 parts of 20 per cent sulphosteatite, were used soon after rains with good results, as also was a treatment of powdered lime 55 parts, 20 per cent sulphosteatite 40 parts, and naphtha soap 5 parts, all these treatments be-

ing liberally applied. Employment of chemical fertilizers with some restriction as regards nitrogen is also claimed to prove helpful in producing a freer lineal growth of the shoots favorable to aeration and to the application of sprays. The chief reliance is placed upon copper sulphate as a basis of fungicidal treatment.

Mildew in 1913, A. CADORET (*Prog. Agr. et Vit. (Ed. l'Est-Centre)*, 34 (1913), No. 34, pp. 238, 239).—In continuance of previous reports (E. S. R., 29, p. 551) the author states that, believing both single and successive outbreaks of downy mildew to be favored by humidity, he tested the effects of 3 sprayings following showers or rains extending over several days in the latter part of May and the early part of June. Almost no injury resulted from mildew, while crops around suffered heavily. Similar tests on a neighboring vineyard showed, however, a loss of about 50 per cent, heavy dews being noted in this case. Further tests are contemplated.

A Botrytis disease of dahlias, M. T. COOK and C. A. SCHWARZE (*Phytopathology*, 3 (1913), No. 3, pp. 171-174, pl. 1).—During the past year the authors' attention was called to a root rot of dahlias in storage. The disease appeared to be most severe under warm, moist conditions, combined with poor ventilation, and was caused by a species of Botrytis corresponding very closely to the description of *B. cinerea*. Infections always take place through wounds, and it was impossible to secure the penetration of the fungus through the uninjured epidermis.

Some fungus diseases of trees, L. H. PAMMEL (*Proc. Iowa Acad. Sci.*, 18 (1911), pp. 25-33, pls. 4, figs. 2).—Descriptions are given of the heart rot of *Populus tremuloides*, due to *Fomes ignarius* and *F. applanatus*; the oyster fungus (*Pleurotus ulmarius*) on box elder and basswood; the root rot fungus (*Polystictus versicolor*) on maples, oak, apple, cherry, and other deciduous trees; the root rot of oak, due to *Armillaria mellea*; the spot of butternut and black walnut (*Gnomonia leptostyla*); and attacks of *Taphrina* on the Rocky Mountain hard maples.

Shade tree troubles, G. E. STONE (*Massachusetts Sta. Rpt. 1912, pt. 1, pp. 73-83, pls. 7*).—The author describes staghead and root injury to maple and other trees, injury to cork cambium, sun scald, bleeding, injuries from snow, effect of grading on trees, and injuries from various treatments for protection against insect pests.

Chestnut blight, G. E. STONE (*Massachusetts Sta. Rpt. 1912, pt. 2, pp. 33, 34*).—A brief account is given of observations by the author on the spread of the chestnut blight and the injury which it is causing. This disease seems to be spreading in the Connecticut and other western valleys of the State, while the eastern central section of the State still remains comparatively free from the disease. Along with the blight there is said to be a deterioration of chestnut trees which is in no way associated with the blight fungus.

The blights of coniferous nursery stock, C. HARTLEY (*U. S. Dept. Agr. Bul. 44, pp. 21*).—The author describes the more common blights to which coniferous nursery stock is subject and offers suggestions for their control. Among those described are sun scorch, winterkilling, diseases due to parasitic fungi, stem girdle, mulch injury, red cedar blight, and mechanical root injury.

Sun scorch, which is said to be the commonest summer trouble, results in the death of the roots before the tops are killed and is due to excessive water loss. Watering, shading, and the avoidance of crowding, as well as increasing the humus content of the soil should be adopted for the prevention of this injury.

Winterkilling is due to the drying out of the plants when the soil is frozen and may be prevented by the use of a light straw mulch or windbreaks.

Mulch injury follows the heavy mulching of the plants and may be avoided by the use of light mulches and spraying with Bordeaux mixture before the application of the mulch.

The fungus diseases described are needle cast due to *Lophodermium pinastri*, blight caused by *Pestalotzia funerea*, root rots due to *Rhizoctonia* sp., and stem girdle caused by a fungus which may prove to be *P. hartigii*. Notes are also given on the red cedar blight, concerning which but little is known, and no recommendations are made for its control.

Herpotrichia and Neopectia on conifers, W. C. STURGIS (*Phytopathology*, 3 (1913), No. 3, pp. 152-158, pls. 2).—The author reports having observed in northern Wyoming in 1902 the prevalence of a fungus on leaves and twigs of *Abies lasiocarpa* and *Picea engelmanni*. Later and in nearly the same locality what appeared to be the same fungus was found on *Pinus murrayana*. An examination made of the specimens collected showed that that occurring on the fir and spruce was *H. nigra*, while that on the pine was *N. coulteri*.

The damage caused by these two fungi is, so far as the author's observation goes, very slight, but on account of the possibility of their causing the destruction of conifers in seed beds or later, attention is called to them, and both species are described and their synonymy given.

A new rust, G. E. STONE (*Massachusetts Sta. Rpt. 1912, pt. 1, pp. 41-44*).—The occurrence in the State of the Cronartium form of *Peridermium strobi*, the cause of the white pine blister rust, is noted. The rust was observed on a block of 200 currant plants which had been introduced from a New York nursery. Nearly all the plants were infected, although a small block of black currants a quarter of a mile away showed no indication of the fungus, nor did a rigid examination of a plantation of 8-year-old pines reveal any signs of blister rust infection. As the black currants are not considered of any great economic importance the author suggests their destruction.

Spotting of rubber on the plantation, V. CAYLA (*Jour. Agr. Trop.*, 13 (1913), No. 145, pp. 221-223).—Referring to articles published by K. Bancroft (*E. S. R.*, 29, p. 451) and others, the author gives a brief outline of the beginning and progress of this condition of rubber appearing in the various stages of its production, mentioning several organisms found in connection therewith.

An investigation of lime-sulphur injury, its causes and prevention, V. I. SAFRO (*Oregon Sta. Research Bul.* 2, pp. 32, pls. 4).—Attention is called to the uncertain usage of the term lime-sulphur injury, and on account of this indefinite use the author has carried on some investigations to determine what chemical ingredients of the lime-sulphur spray can be classed as injurious in a strict sense.

A series of experiments was conducted in which the various materials which go to make up the spray and the compounds which are liable to occur in the spray before and after its application were used. These were sprayed on potato and bean foliage as well as on the foliage and fruit of apples, pears, cherries, peaches, and plums. Considerable varietal susceptibility to lime-sulphur injury was noted, but it was found that the injury, in the proper use of the term, was caused by the calcium polysulphids and to a somewhat less extent by calcium thiosulphate. The other normal ingredients occurring in the lime-sulphur mixture, either before or after its application, were found to be harmless.

A test was made of a number of samples of lime-sulphur mixture to determine whether their specific gravity could be taken as an index of their possible injurious effect. It was found that the specific gravity alone of the lime-sulphur spray does not indicate to what extent sulphids are in solution and

that different experiments using the densities of different concentrates as bases for dilution can not be compared accurately, so far as spray injury is concerned.

In an investigation made of means for the prevention of lime-sulphur injury it was found that it could be prevented to some extent by a considerable dilution of the solution or by the use of substances that would render the sulphids insoluble. Among those tested were iron, copper, and zinc sulphates, sulphuric acid, and carbon dioxide.

The author considers self-boiled lime sulphur to be a mixture of lime and sulphur rather than a combination. Much of the injury attributed to lime-sulphur sprays he attributes to other causes, particularly to sunburn.

Spreading capacity and adherence of sprays, V. VERMOREL and E. DANTONY (*Prog. Agr. et Vit. (Ed. l'Est-Centre)*, 34 (1913), No. 25, pp. 778-780).—This is a brief general discussion of the constitution of sprays intended for ordinary protective purposes; also of those intended to be especially adapted to spreading on application or to adherence under adverse weather conditions, or to both these purposes.

Preparation of alkaline sprays, V. VERMOREL and E. DANTONY (*Prog. Agr. et Vit. (Ed. l'Est-Centre)*, 34 (1913), No. 24, pp. 745, 746).—The authors give formulas and directions for the preparation of Bordeaux and Burgundy mixtures claimed to possess superior qualities as regards both spreading and adhesion, casein and gelatin being employed for this purpose.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Game protection and propagation in America, H. CHASE (*Philadelphia and London, 1913*, pp. V+238).—A handbook of practical information for officials and others interested in the cause of conservation of wild life.

Game law blue book, C. B. REYNOLDS (*New York, 1913*, pp. 136).—A compilation of the game and fish laws of the various States and of Canada, revised to date.

Rats and their extermination, W. A. DALEY (*Pub. Health [London]*, 27 (1913), No. 1, pp. 23-28).—This paper draws attention to the public health aspects of the rat problem and the methods of destroying these pests.

Rat proofing a municipal sewer system, F. SIMPSON (*Pub. Health Rpts. [U. S.]*, 28 (1913), No. 44, pp. 2283-2290).—A report of an investigation conducted with a view to finding a practical method of rat proofing the sewer system of San Francisco.

A history of the game birds, wild fowl, and shore birds of Massachusetts and adjacent States, E. H. FORBUSH (*Boston: Mass. Bd. Agr., 1912*, pp. XVI+622, pls. 37, figs. 108).—Following a brief introduction (pp. 1-35) the subject is dealt with under the headings of (1) a history of the birds now hunted for food or sport in Massachusetts and adjacent States (pp. 39-396); (2) a history of the game birds and other birds hunted for food or sport, which have been driven out of Massachusetts and adjacent States, or exterminated, since the settlement of the country (pp. 399-494); and (3) the conservation of game birds, wild fowl, and shore birds (pp. 497-595).

Insect porters of bacterial infections, C. J. MARTIN (*Brit. Med. Jour.*, 1913, Nos. 2714, pp. 1-8, figs. 12; 2715, pp. 59-68, figs. 12).—A summarized account delivered before the Royal College of Physicians.

Insect record for 1912 in Massachusetts, H. T. FERNALD (*Massachusetts Sta. Rpt. 1912*, pt. 2, pp. 85-87).—The year was made notable by the large number of different insects, some 400 forms, about which inquiries were made. Among the more important were various plant lice; the elm leaf beetle; the bronze birch borer (*Agrilus anxius*); the apple tree tent caterpillar; the apple

twig borer; the bud moth; the juniper scale (*Diaspis carueli*), a European pest which was found in such abundance on plants imported from abroad as to seriously injure them; the box leaf miner (*Monarthropalpus buxi*) which seriously attacked box hedges; the cottonwood leaf beetle (*Lina scripta*) which fed on the leaves of poplars in a nursery at Agawam; the chestnut borer (*Leptura zebra*), observed in connection with the chestnut bark disease; the fall army worm, which was unusually abundant and destructive; and termites (*Termes flavipes*) which attacked the stems of growing cabbages and corn plants.

General survey of the insect fauna of the soil within a limited area near Manchester; a consideration of the relationships between soil insects and the physical conditions of their habitat, A. E. CAMERON (*Jour. Econ. Biol.*, 8 (1913), No. 3, pp. 159-204, pls. 2, figs. 3).—Part 1 (pp. 159-187) of this paper consists of a general survey of the insect fauna of the soil at the grounds of the experimental laboratory, Fallowfield; part 2 (pp. 187-199) deals with the soil insects and the physical conditions of their habitat.

Phytopathological report for the year 1912, P. MARCHAL (*Bul. Agr. Algérie et Tunisie*, 19 (1913), No. 9, pp. 193-199).—This report deals with the occurrence of the more important insect pests of the year.

Report of the entomologist, E. BALLARD (*Nyasaland Dept. Agr. Ann. Rpt. 1913*, pp. 29-32).—This report deals largely with the occurrence of insect pests during the year.

List of insect pests, H. MORSTATT (*Pflanzer*, 9 (1913), No. 6, pp. 288-296).—This is a classified list of the more important insect enemies of plants and plant products in German East Africa, with the nature of their injury.

[Cranberry insects in 1912], H. J. FRANKLIN (*Massachusetts Sta. Rpt. 1912*, pt. 1, pp. 225-234).—This is a report of observations and study made of cranberry insects on Cape Cod in 1912 in continuation of those previously noted (E. S. R., 28, p. 352), and of which an account from another source has also been previously noted (E. S. R., 28, p. 854).

As regards the fruit worm (*Mineola vaccinii*) the author states that late holding of winter flowage is the surest method of control thus far discovered and that spraying as a remedy for it is still of doubtful practicability. There are, however, a few bogs which can not be winter flowed that will pay a moderate return if the fruit fly is kept within bounds. The experimental resanding of such a bog on May 23 to a depth of 1 in., the uprights being raked up through the sand when covered by it, was but partially successful, since numerous moths were observed on netting which covered the experimental plat and some 40 per cent of the berries which developed on this area were destroyed by fruit worms. The author thinks that the best treatment for this insect on such bogs would consist in the destruction of the remnant of the crop in the years when the severe injury either from frost or winter-kill occurs and that this could probably be most readily done by spraying with a 20 per cent solution of iron sulphate. It is his opinion that as a rule more is lost through injury done to the vine in harvesting a very light crop than is gained by saving and marketing the berries.

The flowed bog fireworm or blackhead cranberry worm (*Rhopobota vaccini-ana*) is the source of but little or no damage on bogs that are not winter flowed. The main cause of serious infestation by this pest is the killing and driving ashore of its natural enemies by flowage, as was pointed out in the report of the previous year. Through collections made by sweeping it was determined that spiders are the most numerous of all forms capable of destroying the fireworms. Comparisons showed that the dry bog had far more spiders and also a

somewhat larger number of parasitic insects than did any of the winter flowed bogs even as late as August 20. The information obtained in the study of this insect emphasizes the importance of spraying with arsenical poisons before the infestation starts. Since most bogs should be sprayed several times each year to control fungus diseases, Paris green for use against the fireworm may be applied at the same time by adding 1 lb. to every 50 gal. of Bordeaux mixture. A brief description is given of the most successful treatment for the control of the cranberry insects through the application of water to the bogs which has come to the author's attention. He states that there is little doubt that any bog can be freed from this fireworm by treating it for a few years as a strictly dry bog.

The season's observations of the cranberry girdler (*Crambus hortellus*) are said to sustain in every particular the conclusions concerning it reached the previous two years. Resanding every other year is usually sufficient to prevent infestation by it. Reflowing for a week or 10 days right after picking is still a standard remedy for it where sufficient water is available.

Methods of controlling mill and stored grain insects, together with the habits and life histories of the common infesting species, G. A. DEAN (*Kansas Sta. Bul. 189, pp. 139-236, figs. 62*).—The first part of this bulletin deals at some length with the use of heat as a means of controlling mill insects, and reports experiments conducted, many of the details of which have been previously noted from other sources (E. S. R., 29, p. 253). The author presents illustrations, temperature records, and other data relating to mills which have used heat successfully. Hydrocyanic acid gas treatment for mill insects is next taken up and described at length. This is followed by a discussion of carbon bisulphid fumigation as a means of destroying insects injurious to grain stored in granaries and small elevators. The last part of the bulletin (pp. 198-236) is devoted to a discussion of the habits and life history of the common stored grain and mill insects, some 25 of which are described and figured.

"The only practical and efficient method at present known of completely controlling all classes of mill-infesting insects is by the application of high temperatures, and this method has been so developed within the last 3 years that it promises to revolutionize the present inadequate methods. In Kansas the heating of several mills has absolutely proved that no stage of a mill insect, even in the most inaccessible places, could withstand the heat, and several mills in Ohio, Illinois, Nebraska, Iowa, Indiana, southern Canada, and elsewhere have corroborated the practicability and the efficiency of heat as a means of controlling mill insects. . . . Many insects do not yield readily to hydrocyanic acid gas, but no mill insect can withstand for any length of time a temperature of from 118 to 122° F. . . .

"A mill that has sufficient radiation to heat it in winter to a temperature of 70° can readily be heated in summer to a temperature of from 118 to 122°. With the heat method there is no possibility of injuring the floors, belts, or mill machinery and there is practically no danger from fire. The Mutual Fire Prevention Bureau, representing eight of the principal millers' insurance companies, recommends the heating system for effective fumigation against all mill and stored grain infesting insects. If a mill is infested with Mediterranean flour moth, hydrocyanic acid gas is a very effective treatment, but in no case where it is possible to use heat is the hydrocyanic acid gas treatment recommended."

The destruction of injurious insects by vegetable parasites, L. LE MOULT (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 34 (1913), Nos. 34, pp. 239-246; 35, pp. 265-277; 36, pp. 297-308*).—This is a general review.

Tests of insecticides, H. T. FERNALD (*Massachusetts Sta. Rpt. 1912, pt. 2, pp. 88-91*).—Several insecticides were tested during the year but no attempt was made to draw final conclusions as to their value.

Entomoid, claimed to be a combination of lime-sulphur and a miscible oil, applied at the strength of 1:50 killed many San José scales, but a sufficient number were left so that the trees were about in their former condition at least 3 months earlier than was the case in 1911. Nicine, used in large amounts in drills to protect corn from wireworms and about the base of onions to protect them from the onion maggot, had no injurious effect on the plants but did not give absolute protection from a light infestation of wireworms nor afford a high degree of protection from the maggot. Soil Fumigant and Insecticide was applied to parts of the same corn plats as Nicine to protect corn from wireworms but the infestation proved to be insufficient to enable a determination of its value. Tests with two commercial brands of zinc arsenite applied at the rate of 1 lb. to 10 gal. of water to elm, maple, and wild cherry leaves showed that both adhered well and destroyed the elm leaf beetle larvæ, but injured the leaves of all three trees. Both applications are believed to have been too strong.

The common house roach as a carrier of disease, R. C. LONGFELLOW (*Amer. Jour. Pub. Health, 3 (1913), No. 1, pp. 58-61*).—Attention is called to the rôle of this insect in the dissemination of various species of bacteria.

Notes on the occurrence of the woolly aphid, *Schizoneura lanigera*, in the core of apples, T. R. HEWITT (*Jour. Econ. Biol., 8 (1913), No. 2, pp. 95-98, fig. 1*).—The author has found the core of Newtown Pippins from California that were purchased from a Dublin fruit dealer to be infested with *S. lanigera*. In 3 of 7 apples examined the aphids were alive. It is stated that externally the apples did not appear to be infested, except for a little mildewy appearance of the eye, but on being cut in two through the core the aphids were easily seen. There is a small channel connecting the eye with the core in this apple and through this channel the aphids gained access to the core. This channel, however, is not common in many varieties.

"The core presented a white moldy appearance, due to the woolly secretion of the aphids. In the apples in which the aphids were dead the cores were moldy, due to the growth of some fungus, which was probably secondary. The damage done to the core was very slight, as the aphids did not appear to have pierced through the carpels. In one apple, which was rather more badly infested than the others, the seeds presented a damaged appearance, but the flesh of the apple was not injured in any instance."

The economic importance of such infestations is found in the possible dissemination of this pest in apples to uninfested orchards or districts.

Report on peach aphid investigations during late winter and early spring, 1912, C. B. HARDENBERG (*Agr. Jour. Union So. Africa, 6 (1913), No. 2, pp. 224-235*).—This is a report of studies of the life history and of control experiments with the black and green peach aphids in the Transvaal.

The black peach aphid is said to be attacked by a hymenopterous parasite and 2 syrphids, *Xanthogramma scutellaris* and an undetermined species. The green peach aphid suffers in addition from the attack of a third species of syrphus fly, and 3 species of lady beetles have been found to feed upon it. Observations of the life cycle of *X. scutellaris* are reported.

Tobacco extract in a solution containing about 0.082 per cent nicotin is the most effective strength and no advantage is gained in using a stronger solution. The green peach aphid can be effectively kept under control by 3 thorough sprayings about 5 days apart, the first being applied as soon as the first leaves open out.

The San José scale in Tennessee with methods for its control, G. M. BENTLEY (*Tenn. Bd. Ent. Bul.* 8, 1913, pp. 24, figs. 21).—This account has been previously noted from another source (*E. S. R.*, 29, p. 53).

Some preliminary notes on a scale insect infesting the banana in Fiji, F. P. JEPSON (*Dept. Agr. Fiji Bul.* 5, 1913, pp. 7; *abs. in Rev. Appl. Ent.*, 1 (1913), *Ser. A*, No. 4, p. 136).—This paper relates to the infestation of bananas by the transparent coconut scale (*Aspidiotus destructor*).

The Abutilon moth (*Cosmophila erosa*), F. H. CHITTENDEN (*U. S. Dept. Agr., Bur. Ent. Bul.* 126, pp. 10, pls. 5).—This is a summarized account of the present knowledge of the Abutilon moth, the larvæ of which defoliate okra, hollyhock, and Abutilon in Virginia and the District of Columbia. It has also been observed feeding on *Hibiscus esculentus* and *Malva rotundifolia* in the District of Columbia and on cowpeas in Mississippi. Technical descriptions are given of its several stages.

The application of a spray consisting of 40 per cent nicotin sulphate $\frac{1}{2}$ oz., whale-oil soap $\frac{1}{2}$ lb., and lukewarm water 5 gal. resulted in the destruction of 95 per cent of the larvæ. A second application resulted in the complete eradication of the pest.

A bibliography of 10 titles is appended.

The red-humped caterpillar (*Schizura concinna*), E. J. VOSLER (*Mo. Bul. Com. Hort. Cal.*, 2 (1913), No. 9, pp. 654-657, figs. 2).—Considerable damage to the apple, walnut, etc., is often caused in the central portion of California by this pest.

The fruit tree leaf roller (*Archips argyrospila*), G. P. WELDON (*Mo. Bul. Com. Hort. Cal.*, 2 (1913), No. 9, pp. 637-647, figs. 6).—This leaf roller is said to have ruined much of the fruit in several orchards in San Diego County, Cal.

A new sugar-cane pest, C. FULLER (*Agr. Jour. Union So. Africa*, 5 (1913), No. 6, pp. 931-933).—This paper deals with a caterpillar which webs together the immature leaves forming the spike of the cane and, living within the protecting tube so formed, feeds upon the inner surface of the outer leaf forming the spike.

The Hessian fly, T. J. HEADLEE and J. B. PARKER (*Kansas Sta. Bul.* 188, pp. 83-138, figs. 15).—In this bulletin the authors have brought together the results of their personal investigations in Kansas, together with a review of the more important findings of other investigators. The subject is dealt with under the headings history and distribution, habits and life history, seasonal history, natural checks, injury, and measures of control. A diagram depicting the life history is included (see fig. 1).

It is stated that six different outbreaks of the Hessian fly have occurred in Kansas during the 41 years that it is known to have been present there. During the last and greatest of these outbreaks, that of 1908, 10,000,000 bushels of wheat were destroyed.

The length of its life cycle is variable, ranging under field conditions from 45 days to 12 months or more, dry weather and cool weather lengthening it, and moist and warm weather shortening the period. "The number of broods is variable. In 1908 main-spring, supplementary-spring, midsummer, main-fall, and supplementary-fall broods were determined. In dry summers it is likely that midsummer and supplementary-fall broods would not appear, and it is likely that in very dry years, particularly when the drought begins early, the supplementary-spring brood might be eliminated."

Under measures of control mention is made of grazing, rolling or brushing, mowing, fly-proof wheat, spraying and dusting infested plants, intermittent wheat culture, and trap planting as of little, if any, value. The useful methods include the destruction of the fly in infested stubble by burning or plowing

under, the destruction of volunteer wheat, and late sowing. "The sources of the flies which form each of the broods are variable, for the members of a single brood came from as many as three different places—old stubble, regular crop, and volunteer wheat. The measures of control must be of such a nature as to close up all these sources of supply. Temperature and moisture are the only climatic elements that appear materially to influence the fly. Low temperature or low moisture, or both acting simultaneously, always retard its development,

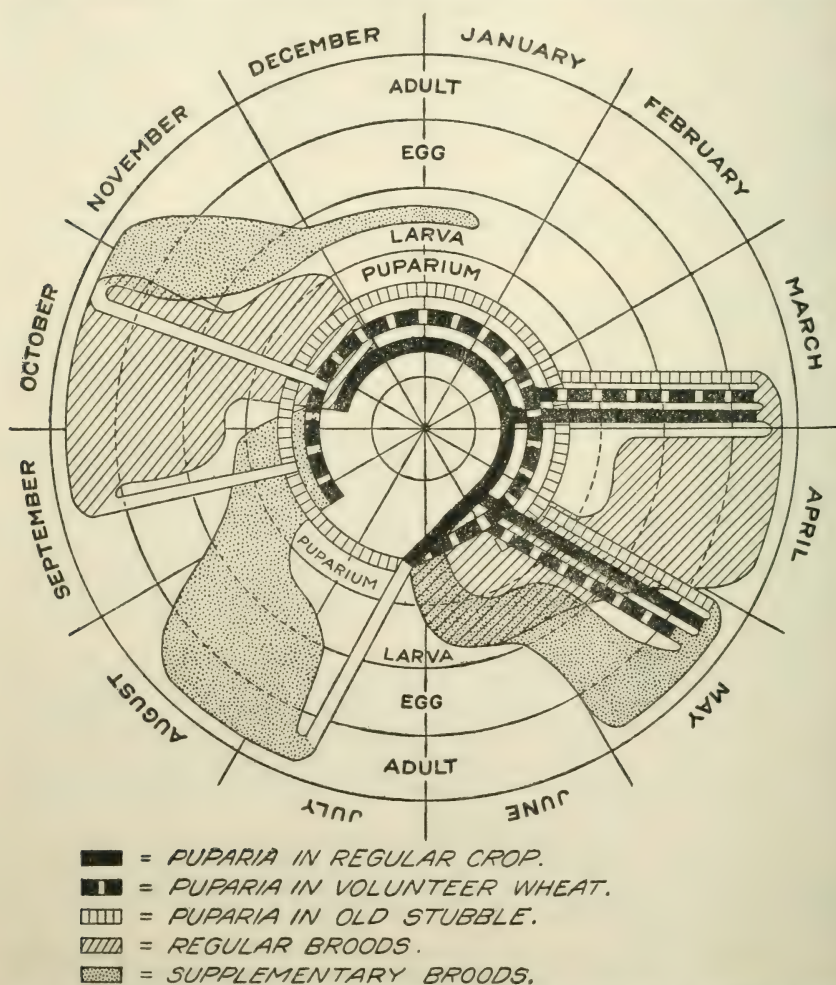


FIG. 1.—Diagram to represent the number of broods of Hessian fly in Kansas in 1908, the period of their appearance, and the sources from which they came.

and may, if extreme, destroy it. High temperature and high moisture are universally favorable to its development. Although both predaceous and parasitic enemies always reduce the fly, their action is so irregular and so rarely sufficient that dependence upon them for protection is folly . . . In the fall the central shoot of the young plant is stunted and killed; if the attack be serious enough, the whole plant and the whole field may be destroyed. Ordinarily the slow destruction of the central shoots causes the tillers to grow vigorously, giving the

field a dark green appearance. In the spring, the maggots interfere with the sap flow, cause the heads partly or completely to fail to fill, and so weaken the stalks that many break and fall before harvest. The fly infesting the old stubble can best be destroyed by plowing the stubble under so carefully and deeply that when the ground is packed down into a good seed bed for wheat, there will be at least 4 in. of soil between the stubble and the surface. The growth of volunteer wheat is a menace, and should not be tolerated before the regular crop is sown. In average years with proper preparation of the seed bed, the date of safe sowing is at least as early as the date on which wheat should be sown to make a maximum yield if no fly were present."

A schedule of procedure based upon the life history studies here reported is outlined which if it is followed it is thought will enable the farmer to escape serious fly damage and give the best possible chance to obtain a maximum crop. A map of Kansas which shows the date of safe sowing calculated directly from 1907-8, 1908-9, and 1909-10 experimental sowings is included, from which the safe-sowing date may be readily determined for the various counties.

The red clover gall gnat (*Amblyspatha ormerodi* n. sp.), R. S. MACDOUGALL (*Jour. Bd. Agr. [London]*, 20 (1913), No. 3, pp. 225-230, pls. 4).—A great destruction of red clover by this cecidomyiid is reported to have taken place during the winter and spring of 1912-13, complaints having been received from a large number of counties. In practically all the samples received red maggots were found either in the soil surrounding the plants or, on dissection, in the spoiled plants.

It is thought that a fungus of the genus *Sclerotinia* and an eelworm (*Tylenchus devastatrix*) may be associated with the gall midge in the injury.

A jumping maggot which lives in cactus blooms (*Acucula saltans* n. g. and n. sp.), C. H. T. TOWNSEND (*Canad. Ent.*, 45 (1913), No. 8, pp. 262-265).—A new dipteran collected from a columnar cactus, probably *Cereus* sp., at the western base of the Andes some 40 miles inland from Lima, Peru, is described as *A. saltans*. This maggot causes the petals to shrivel before they open.

Mosquito extermination and its problems, E. WINSHIP (*Engin. Rec.*, 67 (1913), No. 18, pp. 490-492, figs. 2).—A discussion of the subject by a sanitary engineer in which he outlines the essentials of success in ridding communities of the pest.

The natural host of *Phlebotomus minutus*, F. M. HOWLETT (*Indian Jour. Med. Research*, 1 (1913), No. 1, pp. 34-38, pl. 1, fig. 1).—The author finds the wall lizard, or gecko, to be the natural host of *P. minutus*. He states that there is no doubt but that this fly has a distinct preference for biting lizards as compared with man, and that it is in fact primarily a parasite of the lizard. A *Phlebotomus* (probably *P. minutus niger*) has once been observed biting an agamid lizard, and a sand fly has been observed twice biting the head of the common toad (*Bufo melanosticticus*).

Recent literature, especially the medical literature, on sand flies (*Phlebotomus*, *Simulium*, *Ceratopogoninae*), K. FRIEDERICHs (*Ztschr. Wiss. Insektenbiol.*, 9 (1913), Nos. 1, pp. 26-31; 4, pp. 133-138).—This review follows a list of 63 recent publications on the subject.

Control measures for use against flies, L. VAILLARD (*Rev. Sci. [Paris]*, 51 (1913), II, No. 7, pp. 193-206, figs. 7; *Rev. Gén. Sci.*, 24 (1913), No. 9, pp. 352-358; *Off. Internat. Hyg. Pub. [Paris]*, *Bul. Mens.*, 5 (1913), No. 8, pp. 1313-1336).—A detailed discussion.

The distance house flies, blue bottles, and stable flies may travel over water, C. F. HODGE (*Science*, n. ser., 38 (1913), No. 980, pp. 512, 513).—This paper describes a plague of flies on the cribs of the waterworks, situated 1½, 5, and 6 miles, respectively, out in Lake Erie, from the city of Cleveland, Ohio.

"The only explanation for the above facts seems to be that the flies are blown at least 6 miles off shore, and that they gather on the cribs as temporary resting places."

An unusual outbreak of *Stomoxys calcitrans* following floods, C. FULLER (*Agr. Jour. Union So. Africa*, 5 (1913), No. 6, pp. 922-925).—A discussion of an unusual outbreak of the stable fly in South Africa.

The maggot fly pest in sheep, H. S. MAJOR (*Agr. Gaz. N. S. Wales*, 24 (1913), No. 8, pp. 645-653).—A discussion of this pest has been previously noted from another source (*E. S. R.*, 29, p. 656).

The bean stem maggot, R. W. JACK (*Rhodesia Agr. Jour.*, 10 (1913), No. 4, pp. 545-553, pls. 4).—The author here discusses the life history, bionomics, and injury caused by *Agromyza fabalis*, a native African species which is generally distributed south of the Zambesi. This dipteran is said to be the most serious drawback to the successful cultivation of cowpeas and certain other kinds of beans in this territory.

Experiments for the control of the onion maggot, H. T. FERNALD and A. I. BOURNE (*Massachusetts Sta. Rpt. 1912, pt. 1, pp. 171-179*).—This paper presents the details of experiments in which a number of insecticides and repellents were tested with a view to determining their efficacy in controlling the onion maggot.

The experiments with carbon bisulphid, Nicine, powdered hellebore, a hellebore decoction, a soap wash, carbolized lime, and kerosene emulsion gave what may be considered as negative results. More satisfactory results were obtained in the control of the maggots from the application of carbolic acid emulsion, made by dissolving 1 lb. of soap in 1 gal. of water, adding 1 lb. of crude carbolic acid, and churning as in kerosene emulsion. Applications along the rows by means of a force pump without a nozzle at strengths of 1:30, 1:40, and 1:50 parts of water decidedly checked the infestation in the rows to which it was applied. It is estimated that the cost of this material and labor varies from \$8 to \$12 per acre for each application, according to the strength used. Since it would be necessary to make at least 3 and probably 4 applications, the cost would amount to from \$35 to \$50 per acre.

"The whole experiment indicates (a) that no entirely effective method of controlling the onion maggot has as yet been discovered; (b) that many of those thus far recommended are of little value, at least on large fields; (c) that the cost of treatment with most of them is so great as to render them unavailable for large areas. Finally, the most promising line of investigation seems to be the discovery of something which will effectually repel the insects or destroy the maggots, and which can be applied either as a part of the planting process or in connection with cultivation, thus avoiding the necessity of special treatments by combining these with usual methods of cultivation."

The manzanita Serica (*Serica anthracina*), E. O. ESSIG (*Mo. Bul. Com. Hort. Cal.*, 2 (1913), No. 8, pp. 622, 623, fig. 1).—This beetle is reported to be a source of serious injury in Eldorado County, California, through its defoliation, especially of the prune and apple. In some instances the trees have been killed by the constant and complete defoliation.

The application of arsenate of lead, at the rate of 8 lbs. to 100 gal. of water to which 8 lbs. of lime has been added, as soon as the beetles appear in the spring is recommended.

A critical discussion of the Halticini attacking Cruciferæ in central Europe, F. HEIKERTINGER (*Centbl. Bakt. [etc.]*, 2. Abt., 36 (1912), No. 1-5, pp. 98-127, figs. 18).—The several parts of this paper deal with the genera and species of flea beetles attacking crucifers and the nature of their injury, the cultivated crucifers attacked, tables for the determination of the species of

Phyllotreta and *Psylliodes* infesting Cruciferae in Germany, Austria, and Switzerland, etc.

The destructive *Eleodes* (*Eleodes omisssa borealis*), E. O. ESSIG (*Mo. Bul. Com. Hort. Cal.*, 2 (1913), No. 8, p. 627, fig. 1).—This tenebrionid beetle is reported to have been the source of injury to orange trees around Bakersfield and to have stripped a large number of apricot and plum trees in an orchard at Wasco, Kern County.

The fruit tree bark beetle (*Scolytus rugulosus*), E. O. ESSIG (*Mo. Bul. Com. Hort. Cal.*, 2 (1913), No. 9, p. 658).—The author records the occurrence of the shot-hole borer in apricot trees at Ontario, Cal., this being the first authentic report of its occurrence in the State.

Investigations of the fungus-growing fruit tree bark beetle *Xyleborus* (*Anisandrus*) *dispar* and its food fungus, O. SCHNEIDER-ORELLI (*Centbl. Bakt. [etc.]*, 2. Abt., 38 (1913), No. 1-6, pp. 25-110, pls. 3, figs. 7; *abs. in Rev. Appl. Ent.*, 1 (1913), Ser. A, No. 8, pp. 259-261).—This is a report of a detailed study of the bionomics of the scolytid beetle *X. dispar* and contains the results of numerous experiments regarding its feeding habits. The experimental propagation of its food fungus *Monilia candida* is also discussed.

The females emerge from their burrows in the spring and soon commence a new system of burrows, the walls of which become lined with a dense mass of this so-called ambrosia fungus upon which the larvæ feed. The spores are said to be spread through being taken up by the adult beetles, and later regurgitated from the stomach.

A billbug injurious to small grain (*Sphenophorus discolor*), H. S. SMITH (*Mo. Bul. Com. Hort. Cal.*, 2 (1913), No. 8, pp. 619-621, figs. 3).—Considerable injury is said to have been caused by *S. discolor* to all varieties of barley, wheat, and oats in the vicinity of Sacramento.

Black brood in bees, I. L. SERBINOW (*Vestnik Russ. Obshch. Pchelovod.*, 1912, No. 11, pp. 426-429; *abs. in Rev. Appl. Ent.*, 1 (1913), Ser. A, No. 3, pp. 94-96).—This article relates to European foul brood and its occurrence in Russia.

A preliminary account of a chalcidid of the genus *Tetrastichus* which parasitizes *Ceratitis* and *Dacus* in West Africa, F. SILVESTRI (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat.*, 5. ser., 22 (1913), II, No. 5, pp. 205, 206).—A new species of *Tetrastichus* reared from *Ceratitis stictica*, *C. giffardii*, and *Dacus cucumarius* in Nigeria, Kamerun, Gold Coast, and Dahomey is described under the name *T. giffardii*.

A new braconid of the genus *Microdus* from Canada, C. H. RICHARDSON, JR., (*Canad. Ent.*, 45 (1913), No. 7, pp. 211, 212).—A new braconid reared from the eye-spotted bud moth at Bridgetown, Nova Scotia, is described as *Microdus ocellanae*.

The enemies of plant pests: The Aphelininae, R. G. MERCET (*Trab. Mus. Cien. Nat. [Spain]*, 1912, No. 10, pp. 306, figs. 68).—A synopsis of this important group of chalcidid parasites, including tables for the separation of genera and species, is presented.

Collembola damaging pine trees, W. E. COLLINGE (*Jour. Econ. Biol.*, 8 (1913), No. 2, p. 99).—The author reports finding that *Seira nigromaculata* causes the young needles on shoots of *Pinus sylvestris* to wither and drop. "The insect seems to be attracted by the resinous gum, and as soon as the leaf bud opens makes its way to the bases of the young leaves and commences to bite into the same; after a short time the needles turn yellow and ultimately fall away. Sometimes only part of the base is destroyed and part of the bud remains in a damaged condition, but in most cases the new buds are completely ruined."

Experiments in the use of sheep in the eradication of the Rocky Mountain spotted fever tick, H. P. Wood (*U. S. Dept. Agr. Bul. 45, pp. 11*).—This is a report of experiments conducted to determine the value of sheep in destroying *Dermacentor venustus* as brought to attention by L. D. Fricks in an article previously noted (*E. S. R., 29, p. 658*).

Two experiments, the first with 20 sheep, the other with 2 sheep, were carried through. The first was conducted in a country known to be well infested with ticks, being adjacent to the foothills and well supplied with bushes of various sorts, a growth of small pines, a few fairly large trees, and several streams of water. The conditions were such that there could have been few, if any, ticks on the sheep at the time they were driven into "ticky" country. During the course of the experiment, which was commenced on June 3, two thorough examinations were made, commencing June 10 and 23, respectively, of each sheep to locate the living ticks and to remove the dead ones. Numerous other, but less thorough, examinations were also made, when any dead found were removed and the living ones noted. In the second experiment ticks were collected by dragging cloths over the ground, and then placed upon the sheep—on the first June 20 and on the other June 25, the examinations also being made twice a day. The details of the results are presented in both tabular and descriptive form.

The experiments show that sheep are good collectors of ticks, 6 sheep with heavy wool having picked up 72 females and 47 males in 11 days. Thus in "ticky" country which is favorable to the herding of sheep it would be advantageous to use them as collectors of ticks, since by dipping the sheep once in 7 days it would seem that much good could be accomplished. In order to bring about the greatest good it would be necessary to herd the sheep with a knowledge of the location of the ticks, since it is extremely doubtful if they would be of much importance as collectors of ticks if allowed to run free. Of 33 female ticks placed upon a sheep in the second experiment but one fed sufficiently to lay eggs. There were in all, however, 6 females which stood a fair chance of engorging, so that it is difficult to say what percentage of females that get on a sheep in nature will engorge to repletion.

Several limitations to the practicability of using sheep exclusively in the eradication of the spotted fever tick, namely, (1) the necessity of eliminating all other live stock except that on which the ticks could be destroyed at weekly intervals by dipping or otherwise; (2) the impracticability of heavily stocking a given area with sheep and attempting to carry the usual number of other live stock on the same pastures; and (3) the necessity of cutting down all vegetation higher than a sheep's back, emphasize the great importance of following the plan of dipping domestic animals which is successfully under way. Thus while sheep may be used under some conditions of the work, the main reliance must be upon the dipping of horses and cattle.

FOODS—HUMAN NUTRITION.

Bouillon cubes—their contents and food value compared with meat extracts and homemade preparations of meat, F. C. Cook (*U. S. Dept. Agr. Bul. 27, pp. 7, figs. 10*).—The composition and nature of commercial bouillon cubes are discussed on the basis of analytical data, in comparison with commercial meat extracts and similar preparations and homemade broths and soups.

The author's summary follows.

"One-half to three-fourths of bouillon cubes is table salt. The cubes are not concentrated beef or meat essence, as many people believe. They are valuable stimulants or flavoring agents, but have little or no real food value. Bouillon cubes, therefore, are relatively expensive.

"Semisolid meat extracts sold in jars are not concentrated beef. They are stimulants and flavoring adjuncts and have only a slight food value, owing to a small amount of protein (muscle-building food) which they contain. They are more expensive than homemade soups.

"Fluid meat extracts are dilute solutions of semisolid meat extracts. They are sold in bottles and are flavored. They are more expensive than the semisolid meat extracts because they contain more water.

"Commercial meat juices are largely deprived of their most valuable food constituent—the coagulable protein, or muscle-building food. They are similar to fluid meat extracts, and some makes cost more.

"Homemade meat broth is more nutritious and provides more meat extractives, protein, and fat at less expense than the commercial preparations.

"Homemade meat and vegetable soup contains much more food and is therefore much cheaper than the bouillons or soups prepared from commercial cubes, extracts, or juices."

Bouillon cubes, F. C. COOK (*Jour. Indus. and Engin. Chem.*, 5 (1913), No. 12, pp. 989, 990).—Analytical data are reported regarding the bouillon cubes referred to above.

"Bouillon cubes on the market at present consist of about 5 per cent of water, 1 to 4.5 per cent of ether extract (fat), and 50 to 74 per cent of ash which is practically all sodium chlorid. The nitrogen bodies and undetermined organic material amount to 20 to 40 per cent. The phosphoric acid (P_2O_5) varies from 0.4 to 1.8 per cent, the total nitrogen from 2.1 to 3.6 per cent, and the total creatinin from 0.49 to 1.67 per cent.

"A cube prepared largely from meat extract gives high total phosphoric acid (P_2O_5), total nitrogen, and total creatinin figures. The amount of nitrogen precipitated by absolute alcohol and hydrochloric acid is also markedly higher than in a cube containing much plant and little meat extract. . . .

"Bouillon is a clear broth, the basis of which is meat; consequently a true bouillon cube should show high creatinin and high total nitrogen figures, and should be prepared entirely, or largely from meat stock or meat extract in addition to the salt and fat present. Several of the cubes on the market contain much more plant than meat extract and are not entitled to the name 'bouillon' unless modified."

Notes on rare fishes sold for food in east London, F. J. STUBBS (*Zoologist*, 4. ser., 17 (1913), No. 202, pp. 377-381).—These notes were collected during the preparation for the Whitechapel (Stepney Borough) Museum of an exhibit of the food fishes for sale in east London and include, besides a description of the method of making casts of the fishes, brief notes on the habitat and appearance of the less common varieties. Among the latter are the greater weever (*Trachinus draco*), beryx (*Beryx decadactylus*), sea bream (*Pagellus centrodontus*), ide (*Leuciscus idus*), sile smelt (*Argentina silus*), lesser ling (*Molva dipterygia*), *Macrurus rupestris*, *Malacocephalus laevis* (*Macrurus laevis*), and lumpsucker (*Cyclopterus lumpus*).

Size of the sample necessary for the accurate determination of the sanitary quality of shell oysters, G. H. SMITH (*Amer. Jour. Pub. Health*, 3 (1913), No. 7, pp. 705-708).—According to the author, consistent results can not be obtained with less than 15 oysters. A standard of purity for oyster liquor should be established similar to the standards in use for water and milk.

Studies of phosphatids, particularly those in egg yolk, J. EPPLER (*Hoppe-Seyler's Ztschr. Physiol. Chem.*, 87 (1913), No. 4, pp. 233-254).—Analytical data are reported and discussed.

The gluten content of flour, K. BUDAI (BAUER) (*Ztschr. Gesam. Getreidew.*, 5 (1913), No. 6, pp. 171-179).—General and analytical data are given regarding the amount of gluten in different flours and its relation to their quality.

A preliminary study on the conditions which affect the activity of the amylolytic enzymes in wheat flour, C. O. SWANSON and J. W. CALVIN (*Jour. Amer. Chem. Soc.*, 35 (1913), No. 10, pp. 1635-1643).—The effects of temperature, the duration of the digestion period, the optimum proportion of flour and water, and the effect on the production of reducing sugars of chemicals were studied, including sulphuric acid, sodium hydroxid, dibasic potassium phosphate, and sodium chlorid in varying concentrations and quantities.

The experiments, according to the authors, showed that "the optimum temperature for the production of the maximum amount of reducing sugars is very near 65°; that the best proportion of water and flour lies between 1:4 and 1:10, and that there is little difference between these two limits. It has also been shown that the largest transformation takes place during the first hour; approximately 88 per cent of the total change occurs during the first hour. The inhibiting effect of various chemicals has been shown. The inhibiting action is greater toward straight flour than toward low-grade."

Some points in the making and judging of bread, ISABEL BEVIER (*Univ. Ill. Bul.*, 10 (1913), No. 25, pp. 44, pls. 7).—As the author points out, the characteristics of good bread are symmetry of size and shape, bloom and crispness of crust, and a tender, elastic crumb of fine grain. The conclusions drawn from the investigation were in effect the following:

Recipes differ widely as regards nonessentials, sugar, salt, and shortening, but agree as to the proportion of 1 cup of liquid to 3 of flour. Yeast is a plant, and so subject to laws of plant growth as regards food and moisture. If in good condition, yeast probably does not influence the flavor of bread. Water is the best liquid as regards flavor. Because of the small proportion used and the fact that almost any form of milk is largely water, little effect on flavor is produced by the use of skim milk or buttermilk. Both seem to contribute to tenderness of crumb.

Salt prevents a flat taste, retards fermentation, and, used to excess, causes loss of color in crust and of tenderness in crumb. Sugar darkens the color of the crust. Within limits, it increases the volume of the loaf. Salt and sugar combined in proportion of 1:2, respectively, improve both flavor and volume.

Bread making is an art that demands careful attention to certain essential details such as character, temperature, and amount of yeast, condition and amount of flour, time and temperature of fermentation and baking. The material of pans is a question of choice. Tin seems to yield the best results in common practice. Covered and uncovered pans have not been tried enough for definite conclusions.

The process of bread making for winter wheat flour differs from the process for spring wheat flour in that winter wheat requires more liquid, a slacker dough, is much better with 3 risings instead of 2, and should be allowed to finish proving in the oven.

A new method of keeping bread fresh and its significance with respect to the night work of bakers, J. R. KATZ (*Chem. Weekbl.*, 10 (1913), No. 24, pp. 488-495, figs. 3).—Experiments on the vapor tension and water content of bread crust showed that so long as the moisture did not exceed 18 per cent the crust retained the characteristics of freshness. In an atmosphere with 85 per cent humidity bread crust remained unaltered for a long time.

Bread remained fresh from 10 to 15 hours when kept in a chamber which contained a shallow pan filled with saturated salt solution, and in which an air circulation was maintained by means of a small ventilating fan. The only

regulation necessary was the addition of water to the brine to maintain the desired concentration. In the author's opinion, such apparatus is particularly well suited to small bakeries, and by its use he believes that it might be possible to do away with night work.

The grinding of corn meal for bread, F. P. DUNNINGTON (*Alumni Bul. Univ. Va.*, 3. ser., 6 (1913), No. 4, pp. 521-532).—The data discussed in this paper were reported in an earlier publication (*E. S. R.*, 28, p. 360).

[Banana recipes], O. W. BARRETT (*Philippine Agr. Rev. [English Ed.]*, 6 (1913), No. 9, pp. 451, 452).—In a discussion of the use of bananas recipes are given for preparing bananas and plantains for the table.

Hickory nuts and hickory nut oil, G. O. PETERSON and E. H. S. BAILEY (*Jour. Indus. and Engin. Chem.*, 5 (1913), No. 9, pp. 739, 740).—An analysis of hickory nut meats is reported in connection with a study of the oil and its characteristics.

According to the authors, "the food value of hickory nuts is high; the oils from the two species of hickory nuts, *Carya ovata* and *C. amara*, are practically identical and are similar to cotton-seed oil; the oil retains the flavor of the hickory nut, and is practically equal to olive oil; [and] the possibility of extracting the oil on a commercial basis should be further investigated."

[Analyses of food, beverages, and drugs], W. HANSON (*Bien. Rpts. State Dairy and Food Comr., State Chem. and State Dairy and Food Bur. Utah, 1911-12*, pp. 191).—The results of a large number of analyses of foods, beverages, and drugs are reported and discussed, and reports of the 2 years' work are presented.

Food and drug and weight and measures laws of the State of Nevada, with the rules and regulations adopted for the enforcement of the same (*Nevada Sta. Bul.* 80, pp. 22).—The full text of the state laws, rules, and regulations is given.

Wisconsin dairy and food laws and decisions of courts, J. Q. EMERY (*Madison, Wis.; Dairy and Food Comr., 1913*, pp. 92).—A compilation of the state laws regarding the inspection, manufacture, and sale of food and dairy products, as amended in 1913, together with court interpretations and rulings.

A study of the use of ice and other means of preserving food in homes, J. R. WILLIAMS (*Jour. Amer. Med. Assoc.*, 61 (1913), No. 12, pp. 932-935, figs. 2).—In this paper, read in the section on preventive medicine and public health of the American Medical Association, Minneapolis, June, 1913, the results are presented of a study of upwards of 100 homes in 5 sections of Rochester, N. Y., socially and economically different. Information was collected regarding the use of milk, means for caring for it, the size, make, and kind of refrigerator used, the amount of ice used weekly and yearly with its cost, and similar topics, and temperature measurements were made of refrigerators, living rooms, and cellars. From his studies the author considers that the following conclusions are warranted:

"The temperatures of cellars or living rooms in dwelling houses are not sufficiently low during the warm months of the year to protect milk and other perishable foods from rapid bacterial decomposition. Therefore an efficient refrigerator in the home is a necessity.

"Most of the refrigerators in common use are almost worthless and grossly uneconomical. There is a large field for the manufacturer who will make a properly insulated and efficient box which can be sold at a moderate price.

"If more economical methods of ice manufacture and distribution were employed, the cost of ice to the consumer could be materially lowered. If to this saving were added that which would result from proper ice box construction,

refrigeration vastly superior to that now found in the average home could be had for at least one-fourth the present cost."

The paper is followed by a discussion.

Cooking and heating with electricity, C. T. PHILLIPS (*Architect and Engin.*, 34 (1913), No. 3, pp. 93-99, figs. 7).—Electric cooking equipment of different sorts is described and data summarized regarding the rates for electricity for cooking purposes in different parts of the United States and the cost of cooking by this method.

The food factor in some sociologic problems (*Jour. Amer. Med. Assoc.*, 61 (1913), No. 16, p. 1463).—In discussing the problem of food in relation to sociological problems, the following statement is made:

"Perhaps our sociologists have not sufficiently appreciated in the past that the occurrence of conditions in which the support of the family and the provision of even the barest necessities prevent the attainment of any variety and interest in life and almost enforce a monotonous existence reacts in a variety of ways on the health and efficiency of the community through the diet factors referred to. The essays at amelioration and reform must accordingly take into account possible changes in the mode of feeding which might set free a greater proportion of the income for other things than food. Dietary habits need to be dealt with in this field quite as much as ignorance and the 'stultifying influence of the surroundings.'"

[Increased cost of maintenance of children] (In *Special Report Chicago Nursery and Half-Orphan Asylum, 1860-1913*. Chicago [1913], pp. 12, 13).—Since its establishment in 1874 the institution has cared for more than 4,500 children for periods varying from a few weeks to a long term of years.

A gradual increase in the cost of support per child has been noted. The average cost of maintenance from 1874 to 1883 was \$79.98 per child per year; from 1884 to 1893, \$88.68; from 1894-1903, \$101.45; and from 1904 to 1913, \$140.60. These estimates "do not take into account the numerous contributions of food, clothing, and general equipment which have made it possible to keep the expenses down to these figures. Nor do they include the maintenance, repairs, and improvements of the building."

Cost of living in Nova Scotia, J. W. RAGSDALE (*Daily Cons. and Trade Rpts.* [U. S.], 16 (1913), No. 157, p. 134).—Data are given regarding the kinds and amounts of food consumed by a family consisting of a man and woman and 4 children.

[Using the usual factors for the composition of food, etc., it has been calculated that the food purchased for this family (calculated to be equal to 3.7 men) supplied 116 gm. protein and 3,325 calories of energy per man per day.]

Food prices in London—an inquiry into present conditions as affecting the poorer classes of workers, J. C. PRINGLE (*London: Charity Organ. Soc.*, 1913, pp. 36).—A large amount of statistical data is summarized and discussed with reference to the kind of foods purchased and the prices paid by families of moderate income. A number of family budgets are included.

The pamphlet as a whole supplies much information regarding the living conditions of the poorer families of the working class in London.

[Luncheon for women clerks employed in the Bank of England], E. M. HARVEY (In *Minutes of Evidence taken before the Royal Commission on the Civil Service, April 10-25, 1913, with Appendices*. London: Govt., 1913, p. 95).—A brief statement regarding the improvement in health which has followed the serving of a luncheon free of cost to women employees in the Bank of England. Whereas numerous cases of neuritis in the arm or some other form of nerve trouble before this was done were prevalent, "complaints of this character are now very rare."

[Dietaries and accounts for Poor Law Unions, England and Wales] (*Local Govt. Bd. [Gt. Brit.], Workhouse Regulation (Dietaries and Accts.) Order, 1900, pp. 27; Rpt. Dept. Com. Local Govt. Bd. [Gt. Brit.] Poor Law Orders, 1 (1913), pp. 8, 15, 16, 37-47, 83-88*).—In the general order issued to the Guardians of the Poor of the several Poor Law Unions in England and Wales, and commented upon and in part reprinted by the committee on the revision of Poor Law Orders, regulations are given regarding dietaries and accounts and rations are outlined in detail. Brief instructions are appended to the list of rations and recipes are given for the preparation of a large number of dishes. Forms for ration accounting are also included.

Diet social service in dispensary work, F. H. KLAER (*Med. Rec. [N. Y.], 84 (1913), No. 18, pp. 792-795*).—This is an account of the results of work carried on in connection with the Social Service of the Outpatient Department and the Medical Dispensary of the Hospital of the University of Pennsylvania.

The patients or families visited by the dietitian fell into two general classes, viz, individual patients suffering with various digestive disturbances or diseases requiring special diets, and families requiring a readjustment of finances, food, and habits of eating, because of debts, malnutrition, and sickness.

Often individual cases became family cases because it was impossible to correct dietary conditions for one member without changing those of the whole household. It was not always possible to obtain satisfactory cooperation, but in the majority of cases the visitors were able to introduce noteworthy improvements in the health and also in the financial condition of the family by teaching more economical ways of buying and utilizing food as well as better methods of preparation, and thus prevented as well as cured many unnecessary cases of malnutrition.

A food clinic (*Jour. Amer. Med. Assoc., 61 (1913), No. 16, pp. 1462, 1463*).—A summary of a paper by W. M. Roach, presented at the Congress on School Hygiene, held in Buffalo, N. Y., in August, 1913. Some account is given of the favorable effects of feeding school children in Philadelphia.

Report to the local government board on bacterial food poisoning and food infections, W. G. SAVAGE (*Rpts. Local Govt. Bd. [Gt. Brit.], Pub. Health and Med. Subjs., n. ser., 1913, No. 77, pp. 80, pl. 1*).—In this digest of data the author summarizes and discusses information regarding the different kinds of food poisoning, both bacterial and that attributed to ptomaines.

According to the report, three considerations should be borne in mind, namely, the association of some outbreaks at least with actual disease of the animals whose flesh was eaten; the probability that in other outbreaks uncontaminated food had become infected from the tissues or intestinal contents of food animals in which bacterial invasion was present, as may happen when a slaughterhouse is used as a place for the preparation of sausages and similar meat foods; and that the spreading of disease by bacterial infection, when present, may be affected by lack of cleanliness and care in handling, preparing, and storing foods.

An appendix contains a list of British and continental outbreaks of food poisoning, recommendations of the local government board on outbreaks, and a bibliography.

The relation of diets and of castration to the transmissible tumors of rats and mice, J. E. SWEET, ELLEN P. CORSON-WHITE, and G. J. SAXON (*Jour. Biol. Chem., 15 (1913), No. 1, pp. 181-191*).—A generous and an insufficient diet were compared, the conclusion being that both susceptibility to transplantable tumors and the rate of growth of transplanted tumors may be influenced positively or negatively by diet—the rate of growth being slower and the number of retrogressions being higher on the low than on the normal diet.

Mixed diet and metabolism (*Med. Rec.* [N. Y.], 84 (1913), No. 17, pp. 759, 760).—This is a brief discussion of the physiological necessity of a varied diet as regards both a sufficient supply of all the nutrients and a variety of food material. The relations of a too simple diet to such diseases as diabetes and irregular gout and to anaphylaxis as shown by anemia, malnutrition, asthenia, etc., are also indicated.

The mineral content of the daily diet, HORNEMANN (*Ztschr. Hyg. u. Infektionskrank.*, 75 (1913), No. 3, pp. 553-568).—The author found in studies with adult men that the amounts of calcium and iron oxids in a daily diet supplying 557 gm. dry matter were respectively 1.72 gm. and 156 mg. With adult women receiving 396 gm. dry matter, the corresponding values were 0.86 gm. and 91 mg., and with a 6-year-old boy receiving 325 gm. dry matter, 0.67 gm. and 57 mg. He is of the opinion that the amounts of calcium and iron supplied by the diets were sufficient.

The normal presence of boron in animals, G. BERTRAND and H. AGULHON (*Compt. Rend. Acad. Sci. [Paris]*, 155 (1912), No. 3, pp. 248-251; *abs. in Jour. Chem. Soc. [London]*, 102 (1912), No. 599, II, pp. 854, 855).—Using a method described in a previous article,^a the authors report the presence of small amounts of boron in the organs and tissues of several animals. It is the most easily detected in the hair, horns, bones, liver, and muscles.

The presence of boron in animals, G. BERTRAND and H. AGULHON (*Compt. Rend. Acad. Sci. [Paris]*, 156 (1913), No. 9, pp. 732-735; *abs. in Jour. Chem. Soc. [London]*, 104 (1913), No. 606, I, pp. 423, 424).—In continuation of the work reported in the previous article, the authors report finding boron in 27 different species of animals, and conclude that it exists normally in small amounts in the bodies of all animals, being more common in the species of marine origin.

The presence of boron in milk and eggs, G. BERTRAND and H. AGULHON (*Compt. Rend. Acad. Sci. [Paris]*, 156 (1913), No. 26, pp. 2027-2029; *abs. in Jour. Chem. Soc. [London]*, 104 (1913), No. 610, I, p. 934).—The presence of 0.08, 0.1, and 0.2 mg. of boron per liter of human, ass's, and cow's milk, respectively, and of 1 mg. per kilogram of dried material from fowl, turkey, and goose eggs is reported.

The frequent occurrence of this element in animal and vegetable products leads the authors to ask the question whether boron, like iron, may not play an indispensable part, possibly catalytic, in the living cell.

The metabolism after meat feeding of dogs in which pancreatic external secretion was absent, F. G. BENEDICT and J. H. PRATT (*Jour. Biol. Chem.*, 15 (1913), No. 1, pp. 1-35).—The increase in the total metabolism of animals and man resulting from the ingestion of food of various kinds has often been observed, and, as the authors point out, there have been two distinct theories as to the reason. One assumes that the increase in metabolism is mainly due to the mechanical processes in digestion, and the other that the increase is due to the specific dynamic action of foodstuffs, that is, that portion of the heat produced which appears as free heat and does not benefit the cells. The one attributes the increased metabolism mainly to mechanical causes; the other, to chemical processes.

Experiments on the metabolism of nitrogen and on carbon dioxid production are reported, the results showing, according to the authors, "that there is no large energy transformation incidental to segmentation, peristalsis, glandular activity of stomach, liver, and intestine, and the movement of the unabsorbed food through the intestinal tract. The attempt to explain the increased metabo-

^a *Ann. Chim. Analyt.*, 15 (1910), No. 2, pp. 45-53; *Bul. Soc. Chim. France*, 4. ser., 7 (1910), pp. 90-99.

list following the ingestion of food by the theory that the increase is a consequence of such movements is, therefore, not justifiable."

Some observations on metabolism in connection with an experimental march, C. H. MELVILLE, W. W. O. BEVERIDGE, and N. D. WALKER (*Jour. Roy. Army Med. Corps*, 19 (1912), No. 6, pp. 661-673, figs. 7).—Observations were made of the body weight, the amount, nitrogen content, and energy value of the food consumed, the liquids drunk, and the nitrogen eliminated in the urine and feces in the case of 3 men taking part in the march. From a study of the results obtained the authors deduct the following practical points:

"If a man has to go short of water for 1 day the effect on the water available for perspiration, that is, for temperature regulation, may persist even in a well trained man for about 48 hours." Even if "a plentiful supply of water is available on the next day [it] will only tend to increase his urinary secretion, not to redress at once the disturbance in water content of his dehydrated tissues." A similar effect results from an uneven allowance of water. "It is extremely important, therefore, to regulate the supply not only from day to day, but also in the course of every day."

The water supply of a man in an untrained condition needs more careful regulation than that of a man in good physical condition.

Report on two experimental marches carried out for the purpose of deciding a scale of field service rations; together with an account of some observations on nitrogen balance, etc. (London: Govt., 1913, pp. 64+[2], pls. 7).—This blue book gives full data regarding an earlier experimental march (E. S. R., 25, p. 266) as well as the one noted above.

ANIMAL PRODUCTION.

Commercial feeding stuffs, W. J. JONES, JR., ET AL. (*Indiana Sta. Bul.* 169, pp. 71-326).—This reports analyses of the following feeds: Wheat bran, middlings, shorts, low grade flours, mixed wheat products, rye middlings, buckwheat bran, buckwheat middlings, buckwheat mixed feed, cotton-seed meal, cotton-seed cake, cotton-seed hulls, linseed meal, linseed cake, distillers' dried grains, brewers' dried grains, gluten meal, gluten feed, corn germ meal, hominy feed, corn meal, corn bran, dried sugar beet pulp, alfalfa meal, blood meal, beef scrap, tankage, proprietary stock and molasses feeds, calf meals, poultry feeds, and condimental stock and poultry feeds.

There is included a synopsis of the Indiana feeding stuffs law, together with a classification of feeding stuffs, and comments on the various feeds and their manufacture.

Use of the bitter acorn in the feeding of domestic animals, A. COURBET (*Bul. Agr. Algérie et Tunisie*, 19 (1913), No. 13, pp. 273-279).—Bitter acorns were subjected to a process of torrefaction and desiccation and thus rendered available as a palatable and nutritive feed for domestic animals. The composition of the fresh acorns is reported as follows: Water 55.3, protein 2.5, fat 3.9, carbohydrates 34.8, crude fiber 4.4, and ash 1 per cent; and the digestible nutrients as protein 2, fat 3.9, carbohydrates 31.3, and fiber 2.7 per cent.

Rations for farm stock (*Bd. Agr. and Fisheries* [London], Leaflet 79, pp. 23).—This publication contains a general discussion of the principles of nutrition and the compounding of rations. Rations applicable to British conditions are given for dairy cows, both summer and winter feeding; for fattening cattle and sheep; for calf feeding; and for ewes, pigs, work horses, and mares with foal.

On the question of the nitrogen retention from the feeding of urea, E. GRAFE (*Hoppe-Seyler's Ztschr. Physiol. Chem.*, 86 (1913), No. 5, pp. 347-355).—

This is a continuation of work previously noted (E. S. R., 26, p. 262). In the feeding of urea to dogs and swine, the results indicated that although there was a heavy loss of nitrogen there was some nitrogen retention in the animal body.

Nutrition of the embryonic chick, I, II, III, H. W. BYWATERS and W. B. ROUE (*Jour. Physiol.*, 45 (1913), No. 6, pp. XL, XLI; 46 (1913), Nos. 2, pp. XX, XXI; 3, pp. XXXIII, XXXIV).—Investigations made of the changes occurring in the white of the egg during incubation indicate that the percentage of water diminishes at a regular rate during the earlier period of incubation, falling less regularly after the fifteenth day. There was less absorption of the protein than of the water. The ratio of coagulable to uncoagulable protein remains practically constant, ranging from 1:5.7 to 1:7.9. The presence of free sugar usually disappears after the seventh day, whereas in infertile eggs it slightly increases. The relation between the uncoagulable protein in egg white and its combined carbohydrate after different periods of incubation was found to be practically constant.

The average daily loss in weight of eggs during incubation was about 0.5 gm. It was fairly constant in the same egg, but varied greatly in different eggs. "In the case of sterile eggs, the daily loss in weight for the same egg is practically constant throughout the whole period of incubation, [but] with fertile eggs, the daily loss may fall slightly until about the middle of the period of incubation and then it begins to rise until at the end it may be half as much again as at the commencement of the incubation." It is deemed possible to ascertain the fertility of the incubating egg by studying the daily loss in weight.

It is shown that as regards the assimilation of egg white the ratio of the coagulable to the uncoagulable protein, i. e., of albumin to ovomucoid, remains practically constant. This is explained on the assumption that "the proteins of egg white are absorbed at the same relative rate, possibly by being previously converted into diffusible substances by enzymes secreted by the embryo itself."

A respiration apparatus for sheep and swine, F. TANGEL (*Kisérlet. Közlem.*, 16 (1913), No. 4, pp. 467-481, figs. 7).—A report of the construction of a respiration apparatus combining the principles of the Pettenkofer-Voit, Atwater-Benedict, and Tigerstedt apparatus.

Twenty-five years of German animal production, HANSEN (*Illus. Landw. Ztg.*, 33 (1913), No. 48, pp. 442-444, figs. 4).—A résumé of the progress of animal breeding and production in Germany, in which it is shown that there has been an increase in the number of horses of 28.2 per cent, of cattle 27.7 per cent, of mutton sheep 137.7 per cent, and of goats 28.1 per cent, with a decrease in wool sheep of 69.8 per cent.

Methods of cattle raising and management under modern intensive farming (*Arb. Deut. Gesell. Züchtungsk.*, 1913, No. 17, pp. 70-93).—This is a complete review and discussion of the methods of cattle raising in operation in the Province of Saxony and portions of Prussia under the modern intensive farming system. The use of home-grown feeds and of barn feeding are emphasized. The financial cost, yields, and profits are itemized and discussed in detail.

Treatise on zootechny.—III, The bovine, P. DECHAMBRE (*Traité de Zootechnie.—III, Les Bovins.* Paris, 1913, pp. 581, pl. 1, figs. 90).—In this volume the author considers in detail the classification, origin, development, and breed characteristics of all the common breeds of cattle as well as of many rare and obsolete breeds of Europe, Asia, and South America. A special study is made of the conformation, body measurements, and ethnological characters of these breeds. There is also included a discussion of the production of beef in France,

Italy, Argentina, the United States, and other countries. The feeding, care, and management of breeding stock are treated in full, together with a study of the most approved methods of beef production. Formulas and methods for determining, by means of measurements of the animal on foot, the dressing percentage and net weight of the dressed carcass are also included.

The author discusses the selection of dairy cattle under the heads of conformation, quality, mammary system, and empirical signs or marks. Under the latter, he treats of the importance of the escutcheon as an index to milk secretion, and explains the various forms of escutcheons and hair swirls as described by F. Guenon.

Breeding cattle in French Guinea, ALDIGÉ (*Rev. Gén. Méd. Vét.*, 22 (1913), No. 259-260, pp. 337-373, figs. 5).—The native breeds of cattle of French Guinea are described and their utility value as beef and milk producers and the opportunities for improvement through the introduction of the zebu are discussed.

On the breeds, breeding, and utility value of the cattle of Dutch East Africa, G. LICHTENHELD (*Pflanzcr*, 9 (1913), No. 6, pp. 261-279).—This article treats of the body measurements, breed characteristics, and utility value of the native breeds of cattle of Dutch East Africa.

The Creole cattle of Salta, T. R. GARCÍA (*Bol. Min. Agr. [Buenos Aires]*, 15 (1913), No. 6, pp. 675-682, figs. 11).—The author describes the native cattle of Argentina, commenting on their utility value and on the opportunity for improvement through the introduction of pure-bred beef sires. The three principal types of native cattle are Chaqueños, Serranos, and Fronterizos.

On beef production [in Argentina], E. LAHITTE (*Bol. Min. Agr. [Buenos Aires]*, 15 (1913), No. 6, pp. 683-689).—The author comments on the extraordinary growth and demand for Argentina meat products, and states that the abnormal demand is producing a spirit of speculation. Statistical reports of exports to the United States and other countries are presented.

The frozen meat industry of Argentina, P. BERGÉS (*An. Soc. Rural Argentina*, 1913, July-Aug., pp. 247-291, figs. 16).—This is a statistical report of the frozen meat industry of Argentina and of the export trade with foreign countries. The industry has undergone a remarkable development and growth in the past few years, and the trade now reaches throughout America, Europe, and the Orient. The relative rank of the various meat-exporting countries is given, showing that for most of the meat products Argentina leads, with Australia and New Zealand as close competitors.

Foreign meat in London, C. R. LOOP (*Daily Cons. and Trade Rpts. [U. S.]*, 16 (1913), No. 246, p. 379).—It is noted that almost the whole of the foreign supply of beef imported into the United Kingdom is now derived from Argentina and Australia. The supply from the United States diminished from 162,000,000 lbs. in 1908 to 685,000 lbs. in 1912. The average retail price for beef on the London market is estimated as follows: Sirloin, 19 cts. per pound; wing rib, 18 cts.; silver side, 16 and 17 cts.; and steaks, 24 to 28 cts.

The shrinkage in weight of beef cattle in transit, W. F. WARD and J. E. DOWNING (*U. S. Dept. Agr. Bul.* 25, pp. 78).—Shrinkage weights were obtained on cattle shipped from various points in the Southwest and Northwest. A general summary of the 3 years' work is shown in the table following.

Shrinkage on beef cattle in transit.

Class.	Number of cattle.	Average weight at origin.	Average gross shrinkage.	Average fill at market.	Average net shrinkage.	Ratio of shrinkage to live weight at origin.
		<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	<i>Per cent.</i>
Range steers in transit less than 36 hours..	197	794	.....	.....	29	3.65
Range steers in transit 36 to 72 hours.....	882	1,186	89	25	64	5.40
Range steers in transit over 72 hours.....	169	1,116	88	27	61	5.47
Range cows in transit less than 24 hours...	1,724	838	60	30	30	3.58
Range cows in transit 24 to 36 hours.....	1,551	896	70	39	31	3.46
Range cows in transit 36 to 72 hours.....	275	1,034	96	46	50	4.84
Range cows in transit over 72 hours.....	177	1,010	70	30	40	3.96
Mixed range cattle in transit less than 24 hours.....	1,511	700	37	22	15	2.14
Mixed range cattle in transit 24 to 36 hours..	872	848	72	18	54	6.37
Mixed range cattle in transit 36 to 72 hours..	622	954	76	39	37	3.88
Mixed range cattle in transit over 72 hours..	988	729	80	29	51	7.00
Range calves in transit less than 24 hours..	773	185	6	7	+1	+ .59
Range calves in transit over 24 hours.....	772	193	6	11	+5	+2.45
Mixed corn-fed cattle in transit less than 24 hours.....	164	1,303	67	16	51	3.91
Mixed corn-fed cattle in transit 24 to 36 hours.....	1,853	1,167	85	37	48	4.11
Mixed silage-fed cattle in transit less than 24 hours.....	666	1,168	76	52	24	2.05
Mixed silage-fed cattle in transit 24 to 36 hours.....	169	1,204	101	58	43	3.57
Cottonseed-meal-fed steers in transit 30 to 48 hours.....	1,296	1,074	72	14	58	5.40
Beet-pulp-fed cattle in transit 60 to 120 hours.....	1,009	1,390	100	25	75	5.40
Beet-pulp-fed cattle in transit 38 to 120 hours.....	2,614	.....	.....	.....	54	.....

It is concluded from these investigations that "the shrinkage of cattle in transit depended very materially upon (a) the conditions existing at the time of shipping and upon the treatment received during the drive to the loading pens; (b) the length of time the cattle were held without feed and water before being loaded; (c) the nature of the fill which the cattle had before loading, a great loss in weight being experienced with succulent grass, beet pulp, or silage; (d) the weather conditions at the time of loading and while in transit; (e) the character of the run to market, slow, rough runs causing a greater shrinkage; (f) the kind of treatment they received at unloading stations; (g) the time of arrival at market, the fill being small if they arrived just before being sold, and cattle that were shipped a long distance and arrived at market during the night usually not filling well; whereas if they arrived the afternoon before or about daylight of the sale day, they generally took a good fill; and (h) the climatic conditions at the market.

"An exceedingly large fill at market is not desired as it will detract from the selling price. The shrinkage on calves may seem small, but under normal conditions it holds about the same proportion to their weight as is found with grown cattle. The difference between the shrinkage of cows and steers is not as great as is ordinarily supposed. Steers will usually shrink somewhat less than cows of the same weight. The shrinkage during the first 24 hours is greater proportionately than for any succeeding period of the same duration. The shrinkage of cattle was found to vary in direct proportion to their live weight when conditions were the same and all other factors were equal. The shrinkage of range cattle in transit over 70 hours during a normal year is from 5 to 6 per cent of their live weight. If they are in transit 36 hours or less the shrinkage will range from 3 to 4 per cent of their live weight. The shrinkage of fed cattle does not differ greatly from that of range cattle for equal periods of time. It varied from about 3 per cent with all of the silage-fed cattle

and 4.2 per cent with the corn-fed cattle, when both classes of these animals were in transit for less than 36 hours, to 5.4 per cent for the pulp-fed cattle which were in transit from 60 to 120 hours. Cattle fed on silage have a large gross shrinkage but usually fill so well at the market that the net shrinkage is small. Pulp-fed cattle shrink more in transit than any other class of cattle, and also present a greater net shrinkage.

"The shrinkage on cattle is proportionately smaller for each 12 hours they are in transit after the first 24-hour period is passed. For a long journey the common method of unloading for feed, water, and rest is to be preferred to the use of 'feed and water' cars. Cattle should be weighed before being loaded wherever practicable, since a comparison of this weight with the sale weight will show the net shrinkage. Moreover this weight at point of origin may be of material benefit to the shipper in case of a wreck or a very poor run to market."

Sheep farming in North America, J. A. CRAIG (*New York, 1913, pp. XVIII+302, pls. 25, figs. 3*).—The chapters included in this book, which is one of the Rural Science Series, are the position of sheep in profitable farming; sheep farms and their equipment; breeds of sheep; formation and improvement of the flock; seasonal management; lambing; fattening; preparation of sheep for show; and diseases.

Boulonnaise breed of sheep, J. TRIBONDEAU (*Jour. Agr. Prat., n. ser., 26 (1913), No. 32, pp. 180, 181, pl. 1*).—This is a brief description of this breed of sheep and its distribution throughout France and portions of Europe. Its characteristics are hardiness and rustling and pasturing qualities, and its improvement and promotion is recommended.

Fitting yearling wethers and lambs for exhibition, G. C. HUMPHREY and F. KLEINHEINZ (*Wisconsin Sta. Bul. 232, pp. 26, figs. 12*).—This bulletin is intended as a practical guide in the selection, fitting, and showing of yearling wethers and lambs for exhibition, but also reports experimental work in feeding.

In order to study the value of the various grain rations during two 3-year fitting periods wethers intended for exhibition at the International Stock Exposition were divided each year into 4 lots as uniform as possible with reference to breed, size, and general quality. They were fed alike as to pasture, hay, cabbage, and roots. Grain feeding began August 1 and continued to the latter part of November.

The results of these feeding operations are summarized as follows: "The wethers fed peas, oats, and bran were awarded first place in the carcass competition between the various lots each of the 3 years of the second period, and were also awarded the largest number of individual prizes at the show. Though peas were comparatively expensive, they produced firm flesh of high quality and also made good gains. They are therefore highly recommended for show fitting when fed in combination with oats and bran. Barley, oats, and bran ranked second in the carcass competition between the lots, and also in number of individual prizes awarded in the open classes. Barley and oats stood third in point of prizes won at the show and also ranked third in the carcass competition. This ration produced the lowest gains of any fed during the second period. Corn, oats, and bran, and corn and oats produced the largest and most economical gains, but, with a few exceptions, the wethers fed this ration were inclined to be soft and overdone. Carcasses from the lot fed corn, oats, and bran were never awarded prizes in the regular carcass classes. Whole oats fed alone are a most excellent feed for sheep which are well advanced in flesh, but as a rule, for sheep being fitted for fat classes, they are too bulky to insure the desired finish."

A former reference has been made to results obtained during the first 3-year period (E. S. R., 18, p. 263).

Cassava for pigs, J. L. FRATEUR and A. MOLHANT (*Min. Agr. et Trav. Pub. [Belgium], Off. Rural Raps. et Communs., 1913, No. 5, pp. 87-118, fig. 1*).—Four pigs 2½ years old each fed a daily ration of 2.02 kg. of cassava, 2.02 kg. of a mixture of bran and low-grade flour, 1.6 kg. of mangels, and 0.18 kg. of meat meal for 77 days made a daily gain per head of 0.53 kg. (1.17 lbs.). In another test 5 pigs each fed a daily ration of 1.47 kg. of cassava, 1.47 kg. of the bran-flour mixture and 4.99 kg. of skim milk for 58 days, made a daily gain per head of 0.67 kg., and a similar lot 0.62 kg. per head. Methods and results of analyses of cassava by J. Van Buggenhout et al. are given.

Trials with weights of fattening swine and the "plucks" from these, E. HOLM (*Ber. K. Vet. og Landbohøjskoles Lab. Landökonom. Forsög [Copenhagen], 82 (1913), pp. 32, figs. 2*).—The average slaughter weight of 400 swine at 3 Danish slaughter houses was 70.8 kg. (warm) and 69.3 kg. (cold), and of the plucks (internal organs and offal) 4 kg. (warm) and 3.9 kg. (cold).

Treatise on zootechny.—II, The horse, P. DECHAMBRE (*Traité de Zootechnie.—II, Les Équidés. Paris, 1912, pp. 494, figs. 68*).—The first part of this book treats of the zoological classification, body conformation, measurements, and race characteristics of domestic animals. The author draws attention to the fact that races or breeds are characterized by their rectilinear outlines, especially the facial profile; that variations in morphology are noted in the cephalic and body form and in the external features, such as weight, color, horns, hair, wool, or plumage; and that in general there is a harmony or coordination of parts.

In the second part he takes up a study of the breeds of horses, classifying them under 3 groups, viz, those with a flat frontal or profile, those of concave frontal, and those of convex profile. These groups are further subdivided and classified. There follows a discussion of the origin, development, breed characteristics, distribution, and utility value of the different breeds of horses. The breeds included in this study are those of Arabia and Asia, Russia and Finland, Bohemia and Tunis, the Percheron, the Clydesdale, the ponies of England and Europe, the Belgian, the Shire, the Suffolk, and a number of the rare breeds of Asia and Europe. There is also given a discussion of the "demi-sang" or grades of England and France, among which are included the army remounts, the hunters, hackneys, and cobs, the Cleveland Bay, and the Irish half-breed.

The author also discusses the various breeds and types of mules and asses, both in Europe and in Asia, and discusses their production from the utility standpoint. There are included several chapters on the feeding, care, and management of breeding stock; and a discussion of the problems connected with the improvement of the military remount service and the government stud.

Did the horse exist in America at the time of the discovery of the New Continent? E. TROUSSART (*Rev. Gén. Sci., 24 (1913), No. 19, pp. 725-729*).—In answer to this query the author offers as proofs of the early existence of the American horse (1) the records of history dating back to the Spanish conquest of Mexico, at which time native horses were discovered here; (2) evidences from geology and paleontology which point to a very primitive type of horse; and (3) the physiography of the country and the character of American animals, which indicate that America's close proximity to Asia facilitated the introduction of the horse from that continent.

The feeding of farm horses (*Dept. Agr. N. S. Wales, Farmers' Bul. 64, pp. 26*).—The first portion of this publication contains general information on horse feeding, condensed from Henry's Feeds and Feeding and other sources. Reports are then given from the principal of the Hawkesbury Agricultural Col-

lege and the managers of experiment farms throughout the State, describing the methods of horse feeding in use at these stations. The information given is of an entirely practical nature, outlining the rations fed and the methods of care and management, including notes on the treatment of horses for colic.

Horse feeding experiments with dried beer yeast, O. VON ZADEK (*Ztschr. Landw. Versuchs. Österr.*, 16 (1913), No. 9, pp. 879-889).—This product proved to be a palatable laxative feed, and especially adaptable as a supplement to oat feeding.

Cotton-seed meal as a feed for laying hens, J. K. MORRISON (*Mississippi Sta. Bul.* 162, pp. 11, figs. 9).—This bulletin is a preliminary report of experiments in progress. Results of 6 months' work tend to show "that cotton-seed meal used as the chief source of protein is palatable to fowls, and that when fed judiciously on it they will produce eggs; that hens fed on cotton-seed meal will produce eggs when eggs are highest in price; that as far as can be determined the general condition of the cotton-seed meal-fed fowls seems just as good as the condition of those fed on beef scrap; that the tendency was to loose flesh and not get overfat, although the fowls were allowed access to the feed at all times; and that there is a good margin of profit from hens when given a properly balanced ration."

Poultry notes, 1911-1913, R. PEARL (*Maine Sta. Bul.* 216, pp. 141-168, figs. 9).—This bulletin includes a general consideration of the following items: The value, method of preservation, and economical use of hen manure; plans for the construction of a concrete manure shed costing approximately \$185; the value and method of construction of a crematory for dead poultry; the making of an improved range feed trough; methods for the protection of poultry against hawks, crows, rats, and other natural enemies; and the value and method of providing green feed for poultry.

The results of technical studies relating to the formation of the egg and previously reported from another source (*E. S. R.*, 26, p. 670) are given.

Mardi Gras poultry in France, E. BROWN (*Country Gent.*, 78 (1913), No. 42, pp. 1543, 1544, figs. 3).—The author describes the preparation of fancy poultry for the Mardi Gras festival of France. The Bresse fowl stands in highest favor, being a light-boned bird with excellent fattening qualities and of a delicate flavor. La Flèche is a larger and somewhat heavier boned breed, but carries abundant meat, which is of a fine texture. Du Mans stands next in favor, being fine and white of skin, abundantly fleshed, and of excellent quality. The Crèveœur fowl is compact, broad, and deep, but lacking in quality. The Courtes Pattes fowl is a delicacy, largely because of its quality, texture, and fine flavor.

Breeders' and cockers' guide, F. R. GLOVER (*Liste, N. Y.*, 1913, pp. 109, figs. 7).—This booklet treats of the breeding, feeding, care, and management of the breeds of poultry used for fighting and pit purposes.

The national standard squab book, E. C. RICE (*Boston*, 1913, 4. ed., pp. 416, figs. 200).—This is a practical manual giving complete directions for the installation and management of a squab plant.

DAIRY FARMING—DAIRYING.

Some practical results of feeding experiments, J. B. LINDSEY (*Massachusetts Sta. Rpt.* 1912, pt. 2, pp. 56-64).—Dairy cows were fed a ration of hay, bran, gluten feed, and raw potatoes, the latter being fed in increasing amounts of from 10 to 50 lbs. per day. The addition of potatoes in 2 out of 3 cases not only checked the natural shrinkage in milk yield but actually increased the flow. It is concluded from these experiments that when potatoes are cut and fed in amounts up to 25 lbs. per head daily they in no way affect the

health of the animal or the yield of the milk. Foreign observations on the feeding of potatoes to steers, oxen, milch cows, dry cows, sheep, and horses are referred to.

The use of molasses and molasses feeds for farm stocks is also discussed.

The food value of plain and molasses beet pulp, J. B. LINDSEY (*Massachusetts Sta. Rpt. 1912, pts. 1, pp. 129-140; 2, pp. 64-66*).—Six cows were fed by the reversal method in periods lasting 5 weeks on a basal ration of hay, bran, and cotton-seed meal to which was added 4.3 lbs. of either corn meal or of beet pulp daily.

The herd lost in live weight 33 lbs. on the corn meal ration and gained 37 lbs. on the beet pulp ration. There was no substantial variation in the yield or average composition of the milk. It required for the corn meal ration 112 lbs. dry matter to produce 100 lbs. of milk, and 20.51 lbs. to produce 1 lb. of milk fat; for the beet pulp ration 110.72 lbs. and 20.54 lbs., respectively.

In a similar experiment to the above molasses beet pulp and corn meal were compared. The amounts of digestible nutrients in each ration were approximately the same. The herd gains were similar. There was no wide variation in milk yields and only a slight advantage in the production of milk fat with the corn meal ration. It required for the corn meal ration 104.4 lbs. dry matter to produce 100 lbs. of milk and 18.72 lbs. to produce 1 lb. of fat; for the molasses beet pulp ration 108.1 and 19.87 lbs., respectively.

The value of oats for milk production, J. B. LINDSEY (*Massachusetts Sta. Rpt. 1912, pts. 1, pp. 141-153; 2, pp. 52-55*).—Three experiments were conducted in which 2 lots of 2 cows each were fed for alternate periods of 4 weeks each, with 1 week between periods, on like amounts of a basal ration of hay and bran to which was added a like amount of either corn meal or ground oats.

The average gain made in live weight with both systems was practically the same, and the yields of milk and of milk ingredients were nearly identical. However, it is believed that the allowance of the basal ration was too large, thus furnishing an excess of nourishment and tending to invalidate the results of the experiment.

The feed cost of milk and of milk fat was for the corn meal ration \$1.40 per 100 lbs. of milk and 24.5 cts. per pound of fat; and the oat ration \$1.46 per 100 lbs. of milk and 25.6 cts. per pound of fat. "While oats are a valuable food, it is not believed they can usually be fed economically to dairy animals in Massachusetts."

Feeding experiments with milch cows, A. CARLIER (*Min. Agr. et Trav. Pub. [Belgium], Off. Rural Raps. et Communs., 1913, No. 5, pp. 39-50*).—This gives detailed data concerning 2 experiments conducted in 1912 and a summary of 4 years' experiments in which comparisons were made of the feeding value of cotton-seed meal and coconut meal. On the whole, it was found that cotton-seed meal was more advantageous from the standpoint of milk production but that coconut meal apparently produced a slightly richer milk and more butter.

Niger cake for milch cows, E. WARSAGE (*Min. Agr. et Trav. Pub. [Belgium], Off. Rural Raps. et Communs., 1913, No. 5, pp. 51-54*).—On a ration of hay, straw, mangels, bran, and wheat 2 cows for 5 days before and 10 days after an experimental period of 30 days gave a daily average per cow of 8.17 liters (about 8.6 qt.) of milk testing 2.59 per cent of fat. During the 30-day period in which the above ration was supplemented with from 1 to 2 kg. of niger cake the average milk production was 8.5 liters testing 3.08 per cent fat. The cows gained 13 kg. and 36 kg., respectively, in weight during the 30 days. An analysis of the niger cake is given.

Feeding experiments with hay and varying amounts of protein feeds for the dairy cow, J. J. OTT DE VRIES (*Verslag Ver. Exploit. Proefzuivelboerderij Hoorn, 1912, pp. 15-37*).—In these experiments the protein-rich feeds proved more expensive without yielding an appreciable increase of milk over the protein-poor feed, and resulted in a lower milk fat percentage.

North Carolina dairy herd records, W. H. EATON (*Bul. N. C. Dept. Agr., 34 (1913), No. 5, pp. 30, figs. 5*).—Yearly tests of 14 North Carolina dairy herds, comprising in all 144 cows, are reported.

Comparing the economy of production as between large and moderate producers, it was found that the cows averaging 374 lbs. of milk fat per annum gave annual profits of \$68.71 per cow, and produced milk fat at a cost of 17 cts. per pound, while cows averaging 165 lbs. of milk fat gave profits of \$19.85, and the milk fat cost 25 cts. per pound.

Report of the Richmond-Lewiston Cow Testing Association, W. E. CARROLL (*Utah Sta. Bul. 127, pp. 193-242, figs. 8*).—During a 2 years' test, involving 26 herds, the average yearly milk yield of the highest herd was 9,685 lbs., and the lowest 4,916 lbs.; the corresponding average yields of milk fat were 330.1 and 197 lbs. During this period the average cost of feed for the highest producing herd was \$44.19 per year; for the lowest \$34.21, while the profit realized from the former was \$69.96, and the latter \$33.61. A wide variation was found in the yield of milk fat and net returns between cows in the same herd. The difference in milk-fat between the most and least profitable cow in each herd ranged from 40.07 to 324.7 lbs.

In studying the effect of length of lactation period upon total milk-fat yield it was found that beginning with a dry period of 2 months the yield gradually decreased from 272.7 to 121.7 lbs. when the cows were dry 6 months or over during the year. No correlation was noted between the amount of fat produced the first month and the annual record. Dairy-bred cows led the scrubs in yearly production and in amount of fat given the first month of lactation and showed a decided tendency toward a longer lactation period. The data indicated that a cow for highest production should be dry longer than one month, but that a rest longer than 2 months adds nothing to her powers of production. Lactation periods of various lengths from 7 to 18.5 months, provided they are preceded and followed by normal dry periods in all cases, seemed to yield the same fat and profit in any given length of time.

Cows freshening in the fall produced on the average 45.1 lbs. more fat and returned \$9.43 more profit above cost of feed during the next 12 months than cows freshening in the spring. The cost of feed was \$5.33 more per head for the cows calving in the fall.

The highest producers were the most profitable. There was a uniform decrease in net returns with a decreasing milk-fat production.

Dairy industry in northern Europe, G. GUITTONNEAU (*Ann. Inst. Nat. Agron., 2. ser., 12 (1913), No. 1, pp. 41-178, figs. 35*).—Part 1 of this report gives the results of a study of the dairy industry in north Germany, Denmark, the Netherlands, and Sweden. In a study of the milk supply of large cities the author deals especially with Copenhagen and Stockholm. In a chapter on the manufacture of butter and cheese descriptions are given of a number of creameries and of the newer forms of creamery equipment and machinery. Notes are also given on the manufacture of casein, milk sugar, and powdered milk.

Part 2 deals with the organization of the export trade in milk products in the Netherlands, Denmark, and Sweden.

Report of the sanitary inspector of the State of Idaho, 1911-12, J. H. WALLIS (*Bien. Rpt. Idaho Dairy, Food and Sanit. Insp. and State Chem., 5*

(1911-12), pp. 19-32, 129-153, pls. 4).—This is a report on the analysis and condition of samples of commercial butter, cream, milk, ice cream, and condensed milk. There is also included a statistical report on the number of cows milked, the average yield, grade of stock, stock water supply, and the scoring of a number of Idaho dairy farms.

Report of the feed and dairy section, P. H. SMITH (*Massachusetts Sta. Rpt. 1912, pt. 1, pp. 118-128*).—This includes the text of an act to regulate the use of utensils for testing the composition or value of milk and cream; also a summary of inspection work with glassware, etc.

The ductal system of the milk glands of the bovine, O. WIRZ (*Arch. Wiss. u. Prakt. Tierheilk., 39 (1913), No. 4-5, pp. 375-421, figs. 7*).—This is an elaborate treatise on the anatomy of the milk glands and the nature of milk secretion in the bovine, dealing with the constitution and function of the alveoli, the relation of milk secretion and the blood streams, the ductal system and its functions, the occurrence of leucocytes, the consistency of the udder, and the size and nature of the milk cistern. A bibliography of 25 references is appended.

[Factors affecting the composition of milk], J. AUROUSSEAU and L. J. PONSCARME (*Ann. Ecole Nat. Agr. Grignon, 3 (1912), pp. 73-106*).—This is a series of papers on the composition of milk from the standpoint of milk inspection, as follows:

Influence of feeding stuffs on the composition of milk (pp. 73-81). Two cows on pasture supplemented with hay, bran, mangels, and linseed cake, with straw ad libitum, for 5 days gave a daily average of 15 liters (about 15.9 qt.) of milk each, containing 4.43 per cent milk fat and 9.03 per cent solids-not-fat. The supplemental feeds were then withheld and the cows had the run of pasture with straw ad libitum for 6 days, during which their average milk production was 18.6 liters each, containing 3.53 per cent fat and 8.74 per cent solids-not-fat. These results were confirmed in a test with 4 cows the following year. In another test with 4 cows for 3 days on a ration of dry fodders, bran, and scant pasture, the average daily milk yield per cow was 10.37 kg. with an average composition of 4.02 per cent milk fat and (the first and third days only) 9.13 per cent solids-not-fat. These cows were then fed a ration of turnips with oat straw ad libitum for 6 days, during which their average milk production was 12.35 kg. each with an average composition of 3.5 per cent milk fat and 8.77 per cent solids-not-fat.

Composition of first and last drawn milk (pp. 87-90). Analyses are reported of the first and last portions of milk drawn into separate receptacles. Of the first half of 2 milkings the fat content was 1.51 per cent, the solids-not-fat 9.45 per cent. The corresponding percentages for the last half of the 2 milkings were 4.86 and 9.04.

Influence of spontaneous creaming on the composition of milk (pp. 91-96). In a test with 5 liters of fresh milk testing 3.9 per cent fat and 9.08 per cent solids-not-fat, a sample of 1 liter poured off at the end of 1½ hours tested 4.5 per cent fat and 8.78 per cent solids-not-fat. A second liter poured off at the end of 2½ hours tested 3.8 per cent fat and 9.19 per cent solids-not-fat. Two liters poured off at the end of 3½ hours tested 4.35 per cent fat and 8.87 per cent solids-not-fat. The remaining milk tested 2.5 per cent fat and 9.65 per cent solids-not-fat. In another test the milk remaining after the withdrawal of the third sample tested 2.2 per cent less fat than the original milk. This milk, after being subjected to these 2 tests, was heated to 30° C. and the test repeated. After the withdrawal of the third sample the remaining milk tested only 0.4 per cent less in fat than the original milk.

Influence of potassium bromid on the composition of milk (pp. 97-106). Doses of 20, 25, and 30 gm. of potassium bromid fed to cows had no appreciable

effect on the quantity or fat content of the milk. The bromid was found in the milk 14 hours after ingestion and for more than 2 days after the last dose. In another test with 2 cows the ingestion of 60 gm. of potassium bromid was followed by diminished milk production and a reduction of fat content. This reaction was rapid, in no case persisting for more than 36 hours after the dose. After the effects of the bromid had passed off the fat content of the milk rose rapidly above the normal, indicating that potassium bromid has a restraining effect on fat secretion. Complete analyses are given of these milks before and after the ingestion of bromid.

The viscosity of cream, F. K. M. DUMARESQ (*Proc. Roy. Soc. Victoria, n. ser.*, 25 (1913), No. 2, pp. 307-322, figs. 5).—Results of experiments testing the viscosity of cream under different conditions are summarized as follows:

"(1) The main factors instrumental in varying the viscosity of cream are acidity, temperature, and fat content, and of these three the first holds the most important place. (2) An increase in acidity produces very little effect on viscosity of cream, up to the 'critical point,' at which a sudden sharp rise in viscosity occurs. (3) The change in viscosity of separated milk at the degree of acidity corresponding to the 'critical acidity' of cream is very slight, i. e., for separated milk there is no critical acidity, proving that this is a property of the fat globule, or rather of its envelope. (4) An increase in temperature of cream diminishes its viscosity, at first rapidly, afterwards at a slower rate. (5) The viscosity of cream is a quadratic function of the fat content, if the other factors remain constant."

On the influence of different factory methods on the water content of the curd of Edam cheese, W. VAN DAM (*Verlag Ver. Exploit. Proefzuivelboerderij Hoorn, 1912, pp. 84-91*).—In these tests the moisture content ranged from 46.8 to 52 per cent. Poorly coagulated curd tested higher than normal curd. The addition of calcium chlorid increased the moisture content, whereas longer standing reduced it. Working the curd at a high temperature, 29° C. (80.6° F.), resulted in a higher moisture test than working at 26.6°. A low heating temperature, 33.5°, was also conducive to a higher moisture test.

On the faulty "Knijpers" in Edam cheese, F. W. J. BOEKHOUT (*Verlag Ver. Exploit. Proefzuivelboerderij Hoorn, 1912, pp. 92-102*).—The diseased condition sometimes found in Edam cheese affected with cracks or faulty formation is known as "Knijpers." The cracks or rents occur as the result of the formation of gases due to a bacterium which has been isolated. As a preventive for the occurrence of this gas the addition to the cheese of a small quantity of potassium nitrate is suggested.

Wensleydale cheese, MISS G. N. DAVIES (*Jour. Agr. [New Zeal.]*, 7 (1913), No. 2, pp. 147-149).—Directions are given for the manufacture of Wensleydale cheese, which is described as a very mellow, rich, finely flavored, and blue molded cheese, resembling the Stilton variety.

Some investigations of parchment paper, S. HALLS and S. HEGGENHAUGEN (*Norsk Landmandsblad*, 32 (1913), No. 31, pp. 369-371).—The results of chemical and physical examinations of a dozen samples of parchment paper used for dairy purposes are given and discussed. The determinations included color, smoothness of surface, weight per square meter, ash in paper and in water-soluble substances, total water-soluble substances, sugar, boric acid, magnesium chlorid, and moisture. Seven of the samples contained from 14.2 to 26 per cent of water-soluble substances, and 4 contained from 13.2 to 14.5 per cent of reducing sugars.

VETERINARY MEDICINE.

Report of the civil veterinary department, Eastern Bengal and Assam, for the year 1910-11, W. HARRIS (*Rpt. Civ. Vet. Dept. East. Bengal and Assam, 1910-11, pp. 2+28+2*).—This report includes an account of the occurrence of the more important diseases of animals, preventive inoculations, breeding operations, etc.

Report of the civil veterinary department, Assam, for the year 1912-13, S. G. M. HICKEY (*Rpt. Civ. Vet. Dept. Assam, 1912-13, pp. 3+23+1*).—A report similar to the above.

The diagnosis of newly lactating animals according to Schern's method, E. WEBER (*Ztschr. Tiermed., 17 (1913), No. 5, pp. 205-209*).—Following studies of Schern's method (E. S. R., 21, p. 614) the author states that if an initial milk decolorizes the formaldehyde methylene blue solution (Schardinger's reagent) within 10 to 12 minutes, it may be concluded that it comes from an animal in an advanced state of lactation. If the reagent is not decolorized, however, or if the milk contains strippings, no conclusion can be drawn.

The use of pituitary extract in bovine and equine obstetrics, H. SCHMIDT and M. KOPP (*Abs. in Vet. Rec., 26 (1913), No. 1316, pp. 199, 200*).—This is a report of six cases in which very satisfactory results were obtained.

Serum-therapy in practice, A. R. MENARY (*Amer. Vet. Rev., 43 (1913), No. 3, pp. 284-286*).—This details the author's experiences in tuberculin testing and with antistrangles vaccine, canine distemper bacterin, blackleg vaccine, polyvalent bacterins, and hog cholera vaccine.

Natural variation of *Bacillus acidi lactici* with respect to the production of gas from carbohydrates, J. A. ARKWRIGHT (*Jour. Hyg. [Cambridge], 13 (1913), No. 1, pp. 68-86*).—"A bacillus belonging to the *B. acidi lactici* group has been repeatedly isolated during 11 months from the urine of one patient, and no other Gram-negative bacillus has been found in the same urine during this period. The bacillus has occurred in 2 varieties which differed as regards gas formation only. Variety I formed gas from sugars and alcohols, and Variety II formed acid and no gas from the same sugars and alcohols. The 2 varieties gave identical serum reactions both as regards agglutination and absorption of agglutinins with specific sera prepared from rabbits immunized with the respective varieties. Intermediate varieties as regards gas production also occurred, but were not constant when subcultured. Varieties I and II remained constant in their characters after 4 months' subculture on broth and agar. Variety II, which at first did not produce gas from sugars, was induced to do so by first growing in a solution of sodium formate in broth."

The action of the protein poison on dogs: A study in anaphylaxis, C. W. EDMUNDS (*Ztschr. Immunitätsf. u. Expt. Ther., I, Orig., 17 (1913), No. 2, pp. 105-134, figs. 4*).—This article indicates that the symptoms produced by the injection of the poisonous portion of the protein molecule are practically the same as those which are noted in acute anaphylaxis, with the exception that in the last-named case the blood loses its coagulating power.

About the specificity and the diagnostic value of the Ascoli thermoprecipitin reaction for detecting hematic carbuncle and erysipelas, G. FINZI (*Centbl. Bakt. [etc.], 1. Abt., Orig., 68 (1913), No. 5-6, pp. 556-562*).—The author concludes that the thermoprecipitin reaction has no specific value for the diagnosis of either hematic carbuncle (anthrax) or erysipelas. Extracts of the organs of animals affected with carbuncle give a zonal reaction with a specific erysipelas serum, and derivatives of the *Bacillus suispestifer* and the products of the Preisz-Nocard bacillus also show a specific reaction. Sera from sound horses, heated from 6 to 12 to 48 hours at from 55 to 56° C.,

react with the organ extracts from animals affected with anthrax, as do also normal sera of bovines, rabbits, and guinea pigs. Egg white behaves toward the derivatives in the same way.

A specific reaction can be obtained with extracts of the epiploon, heart, liver, or spleen of guinea pigs affected with carbunculosis. The extracts of the epiploon were more active than those of the spleen.

Thermoprecipitation in anthrax, Z. SZYMANOWSKI and J. ZAGAJA (*Ztschr. Infektionskrank. u. Hyg. Haustiere*, 12 (1912), No. 3, pp. 256-265; *abs. in Ztschr. Immunitätsf. u. Expt. Ther.*, II, Ref., 6 (1913), No. 8, p. 719).—A group of animals is described in which 69 were suspected of having anthrax. Of these, 33 gave a positive and 22 a negative precipitin test. These findings were verified by the bacteriological examination. In 11 cases the thermoprecipitin reaction showed positive when the bacteriological test showed negative, but in only 3 cases did the thermoprecipitin test show negative when positive results were found bacteriologically.

Anthrax vaccination, its use and abuse, J. A. GOODWIN (*Amer. Vet. Rev.*, 43 (1913), No. 3, pp. 267-275).—This discusses the reasons for failure in anthrax vaccination, the kinds of animals to vaccinate, points to be considered in immunizing animals, impotency of some vaccines, the advisability of hyper-immunizing animals, abuse of anthrax vaccination, and the promiscuous distribution of vaccines and other biological products by unreliable parties.

Feeding experiments with the virus of infectious bulbar paralysis, S. VON RÁTZ (*Ztschr. Infektionskrank. u. Hyg. Haustiere*, 13 (1913), No. 1-2, pp. 1-7).—The experiments showed that the virus of this disease may be ingested by mice and Carnivora in infected food and the disease produced in this way. Five of 11 cats and dogs fed upon virulent material died.

The relationship between the paratyphoid infections in man and in animals, D. A. DE JONG (*Rev. Gén. Méd. Vét.*, 22 (1913), No. 255-256, pp. 117-123; *abs. in Jour. Compar. Path. and Ther.*, 26 (1913), No. 3, pp. 266-268).—The author concludes that "bacterial diseases of animals slaughtered for meat can only be considered as the cause of meat poisoning in very exceptional cases. The organisms in question occur in nature as saprophytes and are to some extent excreted by diseased or healthy men and animals (carriers). They can be found normally in healthy men and animals. In such cases they may be the cause of secondary infections. They can infect the carcasses or animal products of even healthy animals, but more particularly the carcasses and products of diseased animals, because these form a particularly favorable culture medium for the organisms."

Some peculiar and probably specific bodies in the erythrocytes in rinderpest and another allied disease, W. L. BRADDON ET AL. (*Parasitology*, 6 (1913), No. 3, pp. 265-275, pl. 1).—The bodies here described have been invariably found by the author in all cases of typical acute rinderpest during the febrile stages and in the great majority of the cases for long periods up to 8 months after recovery has taken place.

"The occurrence of a body of special, and within certain limits, uniform morphology has been demonstrated in the red corpuscles of animals affected with rinderpest. The movements of the body, the evidence of its growth *pari passu* with the development of the disease, and above all its reproduction in animals in which it was not previously present on the inoculation of material containing it, are evidence of its being a living and independent organism. Its detected presence (so far) only in animals which at the time have, or which probably have had, rinderpest recently, and its entire absence from animals highly susceptible to the disease, but known not to have had it or to have been exposed to infection, affords a presumption that the body is specifically related

to the disorder, or in other words represents a stage in the life history of the specific infective agent; or, it may be, a culture form . . . The specific body resembles no parasite of which the life history is so far known . . .

"The second body described affords evidence of the existence of a second specific complaint which may be and probably has been in the past confused with true rinderpest. It would be important to determine if animals affected by the second complaint when they have recovered are still susceptible to true rinderpest. The second body also is a new form."

About a supposed neutralization of the activity of tetanus toxin by neurin or betain, V. ADSESEN (*Ztschr. Immunitätsf. u. Expt. Ther.*, I, Orig., 17 (1913), No. 2, pp. 135-140).—Either neurin or betain hydrochlorid is capable of neutralizing tetanus toxin, but this is not due to any specific property of the two substances but rather to the inhibition of an acid or an alkali. If an acid or an alkali is added to tetanus toxin, no toxic results are produced.

On "tick paralysis" in sheep and man following bites of *Dermacentor venustus*, with notes on the biology of the tick, S. HADWEN (*Parasitology*, 6 (1913), No. 3, pp. 283-297, pls. 2).—"Tick paralysis" occurs in British Columbia and affects man, sheep, and probably other animals. The disease is caused by the bites of *D. venustus*. It is usually of short duration, is benign in character, but occasionally it persists for long periods, and may terminate fatally. From an economic point of view the disease is of some importance to the sheep industry. The causative agent has not been discovered, and the disease has not been reproduced by inoculation. The most likely hypothesis is that the tick injects a toxin which gives rise to symptoms appearing coincidentally with the complete engorgement of the tick. In three consecutive cases, experimentally produced by me in lambs, paralysis occurred 6 to 7 days after the ticks were put on. In no case did I fail to produce paralysis through the agency of the tick bites. It has been proved that *D. venustus* usually bites sheep along the backbone; possibly the point of attachment may have some bearing on the symptoms or severity of the case."

Experimental "tick paralysis" in the dog, S. HADWEN and G. H. F. NUTTALL (*Parasitology*, 6 (1913), No. 3, pp. 298-301).—This is a report of experiments in which "tick paralysis" was experimentally produced in a dog at Cambridge through the application of a single *Dermacentor venustus* female from Canada. The disease is said to be the same as that observed in sheep and described in the paper above noted. The examination of the dog's blood proved negative.

The chemistry of tuberculin, G. LOCKEMANN (*Hoppe-Seyler's Ztschr. Physiol. Chem.*, 73 (1911), No. 5, pp. 389-397; *abs. in Centbl. Bakt. [etc.]*, 1. Abt., Ref., 52 (1912), No. 1-2, pp. 37).—If tubercle bacilli are grown in a medium containing asparagin as the only source of nitrogen, protein-like substances are developed in the culture medium which are supposed to originate from the tubercle bacillus; consequently the author believes that the metabolic products elaborated by the tubercle bacillus are somewhat dependent upon the make-up of the medium in which they are cultivated.

Contribution to the chemistry of the tubercle bacillus.—A preliminary report, E. LÖWENSTEIN (*Centbl. Bakt. [etc.]*, 1. Abt., Orig., 68 (1913), No. 7, pp. 591-593).—As an initial step in determining whether the composition of tuberculin was dependent upon the nutrient solution used for cultivating the tubercle bacillus, an attempt was made to find a simpler nutrient solution than has heretofore been used for preparing tuberculin. A nutrient solution composed of ammonium phosphate, glycerin, and distilled water was prepared and inoculated with the tubercle bacillus. Some controls received an addition of 0.4 per cent of either sodium chlorid, potassium chlorid, or potassium sulphate.

The greatest growth was noted in the ammonium phosphate flask. The flask containing the sodium chlorid in addition showed a lesser growth, but it was greater than the flask containing potassium chlorid; consequently the presence of potassium, sodium, chlorine, or sulphur is deemed unnecessary for the growth of the tubercle bacillus. The synthetic tuberculin so obtained was found to be as active as that prepared in an asparagin medium.

Experiments in regard to the inhalation of tuberculous material from man by the cat. P. CHAUSSE (Compt. Rend. Soc. Biol. [Paris], 72 (1912), No. 2, pp. 50-52; abs. in Centbl. Bakt. [etc.], 1. Abt., Ref., 52 (1912), No. 14, p. 426).—The inhalation tests, which are a continuation of those previously reported (E. S. R., 26, p. 179; 29, p. 178), were conducted in a small specially constructed chamber, with cats of various ages kept side by side with guinea pigs and dogs. Out of 14 cats only 4 became infected. The tubercular changes produced were in most instances only slight but in others quite extensive. According to this there seems to be a great difference in regard to the receptivity of cats to this disease.

Two cases of spontaneous tuberculosis in the rabbit caused by the avian tubercle bacillus, L. COBETT (Jour. Compar. Path. and Ther., 26 (1913), No. 1, pp. 33-45, figs. 4).—"As tuberculosis caused by one or the other type of mammalian tubercle bacilli is not confined entirely to mammals, but may occur in the parrot, the raven (Rabinowitsch), and probably also in the canary and sparrow, so tuberculosis caused by the avian tubercle bacillus is not limited to birds, but may sometimes be found in the pig, the mouse, and perhaps in man and the ape also."

In this paper two cases of natural infection of rabbits, which were kept in the same yard with a number of guinea pigs and tubercular fowls, are described. Cultural investigations and the results of autopsies are included.

Subcutaneous tuberculosis in bovines, C. PÉRARD and G. RAMON (Bul. Soc. Cent. Méd. Vét., 90 (1913), No. 8, pp. 167-174).—Under the name "subcutaneous tuberculosis" the authors designate not only the disease caused by hypodermic injections but also the condition which is produced by the process of extension whereby the organisms enter the superficial fibers of the muscles. The lesions in this area were found to differ markedly in their macroscopic aspects from those usually noted in classical tuberculosis. They resemble somewhat the metastases which occur in cancer, and those in sporotrichoses or blastomycoses. The diagnosis on the cadaver is rather difficult.

The findings with some cases of this variety of tuberculosis are given.

Investigations in regard to the specific action of tuberculosis serum by mixing tuberculin and tuberculosis serum, A. SATA (Ztschr. Immunitätsf. u. Expt. Ther., 1, Orig., 17 (1913), No. 1, pp. 84-98, pl. 1).—By simply mixing old tuberculin or powdered tubercle bacilli with tuberculosis serum under certain quantitative and other conditions and at a temperature of 35° C., it is possible to produce a poison in vitro which, with sound guinea pigs, will give the characteristic tuberculin reactions. The reactions so produced are characterized by a rise in temperature, resulting in the classical anaphylactic death.

By keeping the toxin for several days in the incubator, its toxicity is destroyed, and consequently it will not be lethal for guinea pigs and will not yield the typical reactions on injection. In this case there probably occurs the scission of the toxic substance, which is supposed to go on in two phases.

Passive transference of tuberculin sensitiveness by tuberculosis serum, and the valuation of the serum by this method, A. SATA (Ztschr. Immunitätsf. u. Expt. Ther., 1, Orig., 17 (1913), No. 1, pp. 62-75, figs. 5).—It is possible to produce a hypersensitiveness in guinea pigs by treating them with tuberculosis serum. The passive immunity so produced is not only character-

ized by a typical rise in temperature when injecting tuberculin, but it is also possible to produce lethal results by the injection of the tuberculin. This process affords a measure of the activity of the tuberculosis serum.

Investigations in regard to the specific action of tuberculosis serum with anaphylatoxin tests, A. SÄTA (*Ztschr. Immunitätsf. u. Expt. Ther.*, I, Orig., 17 (1913), No. 1, pp. 75-83).—Anaphylatoxin (used in Friedberger's sense) can be prepared from tubercle bacilli either by treatment with complement or by pretreatment with normal horse serum or immune serum. A further cleavage of anaphylatoxin into lower nontoxic products can be made if the conditions of the experiments are modified.

In regard to the value of the urochromogen reaction as an indicator for tuberculin treatment, M. WEISZ (*Wiener Klin. Wchnschr.*, 25 (1912), No. 28, p. 1094; *abs. in Ztschr. Immunitätsf. u. Expt. Ther.*, II, Ref., 6 (1912), No. 2, p. 448).—The detection of urochromogen in urine with Ehrlich's diazo reaction or with Weisz' permanganate reaction leads to the conclusion that the disease is in progress. In this stage treatment with tuberculin is useless and in fact its use is contraindicated.

About the use of the precipitation method for diagnosing contagious abortion, S. SZYMANOWSKI (*Arb. K. Gsndhtsam.*, 43 (1912), No. 1, pp. 145-154).—It is shown that with a phenol-sodium chlorid extract of abortion bacilli immune sera of high potency can be prepared. The sera from naturally infected animals seem to give variable results, some giving weak reactions and others no reaction at all.

In a series of tests with sera from a number of bovines which were apparently sound, a precipitation was obtained with the phenol-sodium chlorid precipitant; consequently the precipitation test conducted with this reagent can not be relied upon.

Infectious abortion in cattle, and its control by means of vaccination, O. SCHREIBER (*Deut. Tierärztl. Wchnschr.*, 21 (1913), No. 3, pp. 33-35; *abs. in Jour. Compar. Path. and Ther.*, 26 (1913), No. 1, pp. 54, 55).—This is a complete report of the work previously noted (*E. S. R.*, 28, p. 380). Forty-three of 56 fetuses examined came from 19 farms where abortin was administered to the animals, and in most of the fetuses bacteria in addition to the *Bacillus abortus* were noted.

Methylene blue, a remedy for infectious abortion, F. A. RICH (*Vermont Sta. Bul.* 174, pp. 315-323).—This is a preliminary report of investigations by the author extending over a period of 15 years in the course of which various preventive and remedial agents were tested. In its action on *Bacillus abortus* the author found methylene blue (medicinal grade) to be from twenty to fifty times more effective than carbolic acid. It has proved almost uniformly successful, is readily administered, and is apparently free from danger to man or beast.

In laboratory tests of the effect of methylene blue on the abortion bacillus no growth resulted where methylene blue was used at strengths of 1:1,000 for 1 to 3 minutes; 1:2,000 for 1 to 5 minutes; 1:4,000 for 4 to 8 minutes; 1:5,000 for 30 minutes; 1:6,000 for 1 hour; 1:8,000 for 2 hours; and 1:10,000 for 3 hours.

In his experiments the author made use of 4 herds. Of 30 cows in the first herd, all of which reacted to both the agglutination and the complement fixation tests, one-half received $\frac{1}{2}$ oz. of methylene blue daily on grain or silage for a period of 30 days, while to the other half it was administered in gelatin capsules for a period of 6 or 7 days, the dosage being repeated after a period of 4 weeks. In one animal the disease appeared to have progressed too far for favorable issue as abortion took place on the second day of the treatment. At the time of writing 14 of the treated cows had calved at full term and the remaining 15

were still under treatment and observation. In the second herd each of 31 animals reacting to the agglutination test was given 1/2 oz. of methylene blue on feed daily for 30 consecutive days and all calved normally. In the third herd 23 cows which reacted to the agglutination test received 10 gm. of methylene blue on silage night and morning for 6 consecutive days and after 4 weeks' interval the treatment was repeated, the methylene blue being given in gelatin capsules. At the time of writing none of the 23 animals treated had aborted, and 8 had calved normally at full term. In the fourth herd 9 animals, all but one of which gave positive agglutination tests up to 1 to 50, were given 1/2 oz. of methylene blue in gelatin capsules once a day for 6 days, followed by an interval of 4 weeks, as in herd No. 3. At the time of writing 3 of the 9 cows had calved at full term and no case of abortion had occurred in the herd since the beginning of the treatment.

Generalized mycosis in the bovine, P. LANGRAND (*Hyg. Viande et Lait*, 7 (1913), No. 9, pp. 425-433, figs. 4; *abs. in Vet. Rec.*, 26 (1913), No. 1319, pp. 246, 247).—The author reports upon a case of this disease in a cow, including post-mortem and microscopic findings.

The keeping quality of antihog cholera serum, S. BAROK (*Állatorvosi Lapok*, 35 (1912), No. 48, pp. 569, 570; *abs. in Berlin. Tierärztl. Wchnschr.*, 29 (1913), No. 13, p. 241).—Hutyrá's serum was obtained 1 year after manufacture. In the cases where it was used, it had not only protective power but decided curative properties. Pigs having a temperature of 41.6° C., bloody feces, vomiting, and nosebleed were cured by this serum.

A disease (salmonellosis porcina) in pigs, J. LIGNIÈRES (*Rev. Zootec.*, 4 (1913), No. 45, pp. 503-514).—In Argentina there is a disease prevalent among pigs which resembles hog cholera somewhat, and attacks principally the younger animals. It is characterized especially by the production of necrotic lesions in the intestinal mucosa, in the vicinity of the ileocecal valve, and in the large intestines. Caseation is also noted in the mesentery. It is supposed to be caused by an ultramicroscopic organism.

Inoculation and cohabitation tests, with a discussion of the prophylaxis and serum-therapy, are included.

An enzootic among young pigs caused by a variety of the *Streptococcus pyogenes*, RIEVEL (*Deut. Tierärztl. Wchnschr.*, 21 (1913), No. 12, p. 179; *abs. in Vet. Rec.*, 26 (1913), No. 1318, pp. 230, 231).—Numerous cases of sickness, which appeared among young pigs confined in exposed pens and resulted in a mortality of 50 per cent, were found to be due to a variety of *S. pyogenes*.

Injury to fetlock with purulent infection—autotherapy, J. MACDONALD (*Amer. Vet. Rev.*, 43 (1913), No. 3, p. 300).—A description of a case in a coaching horse from London, which was successfully treated by autotherapy.

Fistulous withers, and synovitis of the coronary joint—autotherapy, R. S. MACKELLER (*Amer. Vet. Rev.*, 43 (1913), No. 3, pp. 300, 301).—A description of cases successfully treated by the method.

Contribution to the knowledge of virus carriers of influenza of the horse, A. M. BERGMAN (*Ztschr. Infektionskrank. u. Hyg. Haustiere*, 13 (1913), No. 3-4, pp. 161-174, figs. 4).—The author reports having found an apparently healthy stallion, 21 years old, which transmitted influenza to all of the mares covered during the last 6½ years of his life. The incubation period of the disease in these mares was from 4 to 6 days. No other changes than the catarrh of the mucous membrane of the seminal vesicles of this animal were detected. Three horses injected subcutaneously with the contents of the seminal vesicles became infected. This stallion is said to have always transmitted the typical catarrhal and never the pectoral form. Three horses that were subcutaneously injected with prostate secretion, the contents of the seminal vesicles, and of

the ampulla of the vas deferens, respectively, showed symptoms of influenza within 3 to 5 days thereafter. The fact that no micro-organisms of etiologic importance could be demonstrated therein microscopically or culturally leads the author to conclude that the virus is ultravisible. He considers catarrhal influenza (Rotlaufseuche, influenza erysipelatosae) and pectoral influenza or contagious pleuropneumonia (Brustseuche) to be two independent diseases.

The etiology and therapy of typhoid fever or influenza in the horse (Pferdestaupe), E. BEMELMANS (*Centbl. Bakt. [etc.], 1. Abt., Orig.*, 68 (1913), No. 1, pp. 8-28, fig. 1).—Investigations extending over a period of 5 years lead the author to distinguish between catarrhal influenza or typhoid fever (Pferdestaupe) and contagious pleuro-pneumonia (Brustseuche) of the horse, which he considers to be two independent affections.

He concludes that the influenza (Pferdestaupe) virus is ultravisible, as reported by Basset (*E. S. R.*, 28, p. 184), since the affection can be transmitted by the porcelain filter filtrate from blood obtained from horses naturally or artificially infected. The virus may remain virulent for a long time, even for 3 years, in the seminal vesicles of a healthy stallion which may infect mares at the time of service. Such mares act as a source of infection to other horses in the stable. The infection is not transmitted to any distance by intermediary carriers. The period of incubation in artificially infected animals is from 3 to 5 days. In blood kept at room temperature the virus loses its virulence in 3 months. The course of influenza is benign, save in colts and pregnant mares, and under normal conditions recovery takes place in from 10 to 12 days. The author considers it desirable that horses at remount stations be artificially infected with the influenza virus and that this be done as soon as possible after their arrival at the station.

Influenza among remounts and its treatment with salvarsan, JÄGER (*Ztschr. Veterinärk.*, 25 (1913), No. 7, pp. 289-299; *abs. in Vet. Jour.*, 69 (1913), No. 460, pp. 470, 471).—This paper is based upon studies of a large number of cases of the disease. The treatment with salvarsan consisted in the injection of 3 gm. dissolved in 150 cc. of a 0.9 salt solution into the jugular vein, one dose being sufficient.

The author finds that "salvarsan causes a quick decline of fever and a shortening of the whole fever period, a slow favorable influence on the activity of the heart, a limiting and retarding of the pneumonia, a beneficial effect on the appetite and general condition—loss of weight seldom occurred, a shortening of convalescence, no checking or avoidance of dreaded subsequent effects—tendonitis, roaring, etc., scarcely any arrest or stoppage of the source of infection, and scarcely any shortening of the duration of the illness."

A note upon strangles in the Philippine Islands, W. H. BOYNTON (*Philippine Jour. Sci., Sect. B*, 8 (1913), No. 3, pp. 237-240).—"From the results derived from the cultures and from microscopic examinations of the purulent discharges, it is evident that streptococcic infection exists in horses in the Philippine Islands.

"Since bouillon cultures had no effect on rabbits and guinea pigs when inoculated subcutaneously, and did have decided effect upon a horse, it proves conclusively that the organism isolated was *Streptococcus equi*. No white mice were on hand, so the virulence of the culture could not be tested on them.

"From the information gained through inquiry it is very evident that strangles is a widespread disease among horses in the Islands, an interesting fact in view of the reputed rarity of streptococcic infections in man."

Protective substances of fowl cholera immune serum, E. WEIL (*Arch. Hyg.*, 76 (1912), No. 8, pp. 343-400; *abs. in Ztschr. Immunitätsf. u. Expt. Ther.*, II, Ref., 6 (1912), No. 12, p. 911).—The immunizing power of immune serum which

was first brought into contact with killed fowl cholera bacteria was lowered or entirely destroyed when injected into animals which received simultaneously intraperitoneal or subcutaneous injections of the bacteria. If the immunization is made 18 hours before the infection, the weakening effect is not noted. If the animal is infected peritoneally and immunized at the same time, but with a dose selected to kill after 18 to 20 instead of 12 hours, the immunizing power of the serum is not affected.

The rapid cure of polyneuritis gallinarum by intramuscular injection of a substance isolated from rice—note on the pathology of the disease, C. WELLMAN, A. C. EUSTIS, and L. C. SCOTT (*Amer. Jour. Trop. Diseases and Prev. Med.*, 1 (1913), No. 4, pp. 295-299).—The investigations of which the preliminary report is here given were carried on along lines similar to those indicated by Funk (*E. S. R.*, 27, p. 868) and others.

Healthy chickens were fed on diets of polished rice, grits, and sago, and in the interval before the symptoms of polyneuritis should show themselves, intramuscular injections were made of extracts of rice polish prepared by the same method as that used by Funk, save that after concentrating "and neutralizing with NaOH, Ba(OH)₂ was added and the barium soaps together with the precipitated phytin filtered off. Barium was eliminated with carbon dioxid and sulphuric acid, following which came the precipitation with phosphotungstic acid, its decomposition with baryta, and concentration of the filtrate in vacuo at from 50 to 56° C."

The authors feel justified in drawing the following provisional conclusions from the investigations as thus far conducted: "The curative substance acts independently of the liver or alimentary tract, and it is readily absorbed from intramuscular injections. Degeneration of the nerves is confined principally to disturbance in the myelin sheath of the fibers. Neither the sensory nor motor tracts of the cord, medulla, or brain undergo any observable changes. There is a possibility that the cause of convulsions may lie in spinal irritation caused by subdural hematomas due probably to increased permeability of the vessel walls."

RURAL ENGINEERING.

Irrigation branch (*Rev. Rpt. Bihar and Orissa [India], Irrig. Branch, 1911-12*, pp. 11+9+24+28+5+2).—The transactions of the irrigation department of the Government of Bihar and Orissa for the year 1911-12 are given in so far as they relate to works of irrigation and navigation.

Irrigation of Santa Cruz Valley, M. C. HINDERLIDER (*Engin. Rec.*, 68 (1913), Nos. 8, pp. 200, 201, figs. 3; 9, pp. 242, 243, figs. 8).—This article describes a system for recovering underground water in Arizona by means of deep wells and pumping stations. Since the water-bearing formation underlying the impervious subformation beneath the valley is comparatively shallow it was necessary to develop unusual and novel features, the most important of which is a recovery system consisting of 19 wells drilled to depths ranging from 45 to 150 ft. in a straight line across the narrow part of the valley to intercept the underground waters, together with the necessary pumping equipment. These wells are connected by means of a gravity conduit of reinforced concrete 4,740 ft. in length, located and built from 5 to 12 ft. below the water plane of the valley.

The distributing system consists of a reinforced concrete pipe line 48 in. in diameter and 1,500 ft. in length, forming the outlet from the recovery system; a 48 in. concrete siphon under the Santa Cruz River; about 7 miles of earth canal, some of which is lined with concrete; and 21 miles of laterals.

Pressure pipes for the conveyance of water and for inverted siphons, B. A. ETCHEVERRY (*Jour. Electricity*, 30 (1913), Nos. 21, pp. 474, 475, figs. 2; 22,

pp. 494, 495, figs. 4).—The mathematical analyses given of the design of sheet steel and wooden stave pressure pipes include the derivation of formulas for thickness of steel pipe, size and spacing of bands, and size of staves for wooden stave pipe. Wooden stave pipe are claimed to be cheaper than steel pipe, not subject to corrosion, to have a greater carrying capacity than a riveted steel pipe of the same diameter, if kept saturated to be of probably greater durability, and to be unaffected by heat or cold. Its disadvantages are that it must be kept saturated continually and is liable to destruction by fire.

Methods of constructing reinforced concrete pressure pipe are described.

The economics of pipe line diameters (*Engin. and Contract.*, 40 (1913), No. 9, pp. 237-240, figs. 8).—In a paper taken from the proceedings of the Pacific Northwest Society of Engineers C. W. Harris analyzes, mathematically and graphically, methods for determining economical pipe line construction for power development, water supply, and irrigation, considering first the smallest pipe which will deliver a given amount of power; second, the smallest allowable diameter without exceeding allowable velocities; and third, economical diameter considering the value of the water right.

The following points are summarized as solutions to these considerations:

When the water consumed has no value it is allowable to use the smallest possible pipe line for power which, with a friction loss of one-third of the total head, will deliver a quantity of water sufficient to produce the required power with the other two-thirds of the total head.

If a pipe line is subjected to a varying head throughout its length, but the cost for any particular diameter remains constant for those various heads, the diameter should also remain constant throughout; but if the cost of the pipe is different for the different heads the diameter should be smaller for the larger head. The correct diameter under any particular head is that which will make $n/5$ of the cost of the pipe for a given length equal to the capitalized value of the power consumed by friction in that same length, n being 2 for steel pipe and 1.5 for wooden stave pipe, and for any pipe taking the index of d in the expression. $\text{Cost} = kd^n$, in which k is a constant depending on the cost of steel per pound, interest, depreciation, etc. With this diameter determined under one head the diameter of the same pipe under any other head should vary inversely as the seventh root of the head if the pipe is a high-pressure steel pipe, or as the ninth root of the head if the pipe is wood stave. If the quantity to be delivered is fixed, and the available friction loss is also fixed, as is the case with a pipe line connecting two reservoirs of fixed elevations, the diameter of the pipe line should vary throughout the length thereof according to the laws expressed above, the head to which the pipe is subjected being the static head for which the pipe is designed.

Light-iron irrigation flume (*Engin. Rec.*, 68 (1913), No. 6, p. 153, figs. 3).—This article notes the use of light semicircular ingot-iron smooth flumes installed on a light wooden substructure on the Pala Indian Reservation in California. The sections vary from 12.5 to 15 in. in radius. After completion carrying-capacity tests gave a value for the coefficient of roughness in Kutter's formula of 0.010 for a 30 in. diameter flume. The total cost, including substructure, was \$2.61 per lineal foot.

Heavy oil as fuel for internal combustion engines, I. C. ALLEN (*U. S. Dept. Int., Bur. Mines Tech. Paper* 37, pp. 36; *Sci. Amer. Sup.*, 76 (1913), No. 1977, pp. 326, 327; *Indus. Engin. and Engin. Digest*, 13 (1913), No. 9, pp. 392-395).—A review of heavy fuel oils available for use in internal combustion engines is followed by a discussion of heavy oil engines, including the Diesel and semi-Diesel types and a summary of the requirements of heavy oil engines

relating to ease of starting, steady and efficient operation at all loads, complete combustion, simplicity in regulation, and low first cost.

The fuel economy of heavy oil engines is briefly summarized as follows: Approximately 0.4 lb. of oil is consumed per horsepower hour, whereas for a steam engine of the best triple expansion type from 1.1 to 1.8 lbs. of fuel are necessary, thus giving an economy ratio of approximately 1:3 in favor of the oil engine.

Fuels that may be successfully used in heavy oil engines are enumerated as follows: Petroleum products, "Steinkohle" oil products, bituminous oils, lignite products, turf oils, shale oils, vegetable oils, animal oils, alcohols, and wood oils.

Specifications for fuels and lubricants for heavy oil engines are summarized as follows: The oil should be mobile at 0° C. Sluggish oils should be heated before being introduced into the engine, and oil should contain not more than 0.4 per cent of material insoluble in xylene. The residue on coking should not be greater than 3 per cent and there should not be more than a trace of free carbon in the oil. At least 80 per cent of the oil should distill over at 350° and heavy oils and residues should properly be distilled before using. The flash point should be between 60 and 100°. A heavy oil containing no material having a low flash point should be enlivened by the addition of about 2 per cent of a "gas oil," the flash point being 60 to 100° or less. The specific gravity should not be greater than 0.920. The heating value should be not less than 9,000 calories, the hydrogen content not less than 10 per cent, and the sulphur content not more than 0.75 per cent. The oil should contain no free ammonia, alkali, or mineral acids, not more than 0.05 per cent of noncombustible mineral matter, and not more than 1 per cent of water. The resin content should be low, the paraffin content not more than 15 per cent, the creosote content not more than 12 per cent, and the asphaltum content sufficiently low to allow the fluid to flow. Fine atomization is essential.

The viscosity of lubricants should be between 9 and 10° Engler at 50°. The lubricants should be liquid at -5° and should not freeze solid above -10°. The flash point should be between 220 to 240° in a Pensky-Martens closed tester. The lubricant should lose not more than 10 per cent by carbonization when agitated with concentrated sulphuric acid, should dissolve completely and clearly in benzene, and should be free from acids and alkali. Animal and vegetable oils should not be used.

It is stated in conclusion that the heavy oil engine can not yet be considered as fully developed, but the fact that petroleum containing as high as 20 per cent asphaltum as well as oils from tars have been successfully used is most encouraging for its future.

Naphthalin for gas engines (*Gas Engine*, 15 (1913), No. 8, pp. 455, 456).—Attention is called to the use of naphthalin in internal-combustion engines. It is stated that this material consists of approximately 94 per cent carbon and 6 per cent hydrogen, melts at 174° F., boils at 424°, and has a specific gravity of 1.15.

Carbureters adapted to the use of naphthalin are (1) those which melt and vaporize the naphthalin itself, and (2) those which vaporize a solution of the substance in some volatile liquid. Ether is the best solvent, but its cost is prohibitive. Benzine dissolves from 30 to 40 per cent at atmospheric temperature, and alcohol may be also used, although in every case a heated carbureter is necessary.

The advantages claimed for naphthalin are as follows: It is not readily inflammable; for a given amount of work it occupies smaller space than gasoline;

it solidifies in cold air, thus minimizing the possibility of leakage; and it has a definite composition.

In French tests of this fuel a 4-cylinder motor with a 135-mm. bore and a 145-mm. stroke developed 35 b. h. p. at 888 r. p. m. at a cost per brake horsepower hour of about $\frac{1}{3}$ ct., and a 2-cylinder motor with an 88-mm. bore and 140-mm. stroke developed 8 h. p. at 1,100 r. p. m. at a cost per brake horsepower hour of about $\frac{1}{3}$ ct.

The naphthalin motor, O. H. HAENSSGEN (*Gas Engine*, 15 (1913), No. 10, pp. 537-542, figs. 6).—The mechanical details and operation of several makes of both 2- and 4-cycle motors operating on naphthalin fuel are described. All of these require a light liquid fuel for starting and stopping and for generating heat, either in the exhaust or in the cooling water, sufficient to melt the naphthalin.

Connecting electric motors for direct drive, C. B. MILLS (*Brick and Clay Rec.*, 43 (1913), No. 5, pp. 468-470, figs. 2).—This article takes up the purely mechanical considerations in the application of electric motors to machinery and deals with the advantages and disadvantages of several styles of connection between motor and machine, including belt, rope, toothed chain, gear-and-pinion connections, and cushion and flange couplings for direct connections.

The transmitting powers of belts and ropes at various speeds are graphically represented and designs of connections are mathematically analyzed. It is stated that since the armature of the average type and size of motor is composed of a great number of parts of little mechanical strength it is important to choose a method of connection which will tend to absorb or minimize shock and vibration.

Installation and care of storage batteries, H. M. NICHOLS (*Sci. Amer. Sup.*, 76 (1913), No. 1965, pp. 130, 131).—This article considers the layout and installation of storage batteries and takes up in detail their operation and maintenance, including the location and correction of the most frequent troubles. These are enumerated as short-circuiting, sulphating, flaking, disintegration, and warping of the plates. It is stated that each cell in a battery should be carefully inspected and tested, when fully charged, once a week, and that a record should be kept of weekly inspections of each cell for comparative purposes.

The Winnipeg tractor trials, L. W. ELLIS (*Sci. Amer.*, 119 (1913), No. 10, pp. 201-204).—These trials, the sixth of their kind, brought out the fact that both large and small farmers are now more keenly interested in the medium to small general-purpose tractor.

The tests consisted of (1) a 2-hour economy brake test; (2) a $\frac{1}{2}$ -hour maximum brake test; (3) a 3 to 5-hour economy, efficiency, and capacity plowing test; and (4) a careful comparison of design and construction. Out of 500 points the first was allotted 150, the second 50, the third 200, and the fourth 100. The highest net score attained was 437.3 points. The brake showings were quite uniformly good, and little distinction was made between the tractors on design and construction. A new feature was the use of a vibration detector. The most severe criticisms on design and construction were on lubricating systems and insufficient protection of working parts from mud and dust.

The plowing tests were held on ground which had been plowed before and which had a 2 ft. growth of weeds. The average cost of plowing per acre for steam engines was 46.3 cts., for kerosene 50.9 cts., and for gasoline 62.1 cts. The 5- and 6-plow tractors plowed about $1\frac{1}{2}$ acres per hour, the 4-plow rigs about 1 acre, 8-plow rigs behind large gas tractors $2\frac{1}{4}$ acres, and 10-plow rigs $2\frac{3}{4}$ to 3 acres. Plow for plow the steam engines showed more capacity, largely due to higher geared speed of travel.

Revolution counters on both engines and brakes showed a variation in belt slippage of from 0.3 to 1.5 per cent.

Gasoline tractors averaged close to 4 times as many horsepower hours per unit of fuel as steam tractors, while kerosene tractors secured about 2 times the fuel efficiency of the steam tractors. Excluding labor costs, however, the steam tractors developed brake horsepower at a rough average of 20 per cent less than the kerosene engines and every steamer defeated every gasoline tractor on fuel cost per unit of brake power. This is considered a powerful factor in retaining the moderate-sized steam tractor of from 50 to 75 b. h. p. wherever threshing is of greater importance than plowing.

Tables of data are appended showing the most important points of comparison, the total scores, and the relative standings.

Mechanical cultivation in Germany, F. BORNEMANN and B. DONÁTH (*Die Motorkultur in Deutschland. Berlin, 1913, pp. VIII+230, figs. 121*).—This book, based on the results of extended experiments, deals, in connection with mechanical cultivation, with economy in the purchase of motor cultivating machinery in Germany, and calls attention to the special points to be considered in the judgment and choice of the various types for various classes of work. A chapter on historical development is followed by a discussion of the relation of mechanical cultivation to political and actual working economy.

From a comparison of motor plows and scarifiers with steam tractor plows it is concluded that the first two are best adapted to shallow surface cultivation while the last is adapted to deep plowing. A comparison of mechanical and electrical cultivation indicates that the first is on the whole the cheaper. An exhaustive discussion of the mechanical details of motor cultivating machinery calls particular attention to those points to be criticized in selecting or buying machinery for various works.

Descriptions of several single systems include both disk and moldboard plows, among which are (1) a plow and motor built together in a single frame, (2) one in which they are in separate frames and connected by chains or other coupling, (3) rope and windlass-drawn gang plows, (4) rotating disk plows, and (5) motor scarifiers.

In conclusion it is stated that so far no motor cultivators have been put upon the market which are adapted to all conditions, and that their profitable use is a matter depending on the good judgment of the owner.

Various devices for drying the autumn forage harvest, RAHM (*Illus. Landw. Ztg., 32 (1912), No. 80, pp. 741, 742, figs. 17*).—Several devices are illustrated and described which are used in Germany, Sweden, and the hill lands of other European countries. Among these are wooden rail frames, post and wire frames, and posts fitted with teeth.

RURAL ECONOMICS.

Cooperation and nationality, G. W. RUSSELL (*Dublin, 1912, pp. 104*).—The various rural activities as they bear upon the social and economic life of a nation and its rural population are discussed in this volume in chapters with the following headings: The problem of rural life, past and present conditions, need for an agricultural revolution, the rise of agricultural cooperation, building up a new social order, town and country, organized communities and political life, the creation of citizens, women on the land, union of men and women workers, farmers and the State, ideals of the new rural society, and life finding its level.

The legal status of farmers' cooperative associations (*Internat. Inst. Agr. [Rome], Mo. Bul. Econ. and Soc. Intel., 4 (1913), No. 10, pp. 18-25*).—This

article enumerates and describes briefly some of the difficulties experienced in organizing farmers' cooperative associations under existing laws in the United States and calls attention to special provisions made for such associations in the States of California, Wisconsin, Massachusetts, Nebraska, and Texas.

Agrarian reforms and the evolution of the rural classes in Russia, P. CHASLES (*Rev. Écon. Internat.*, 10 (1913), IV, No. 1, pp. 55-85).—This article discusses and illustrates the significance of various agricultural questions in Russia, as, for example, the work of the rural bank and its relation to emigration in Russian Asia, the growth of rural estates, transition from agricultural collectivism to individual property, the redistribution of land and the breaking up of the village community, the results of agricultural organization, and the progress of rural agriculture during the last few years.

United effort for farm betterment and rural progress (*Farm and Home [Mass.]*, 34 (1913), No. 731, pp. 639, 643, figs. 4).—This article outlines the plan and describes the efforts of the Hampden County Improvement League of Massachusetts to consolidate the various agencies in the county for economic social progress in the small villages and rural districts. In the 6 months since the league was formally organized, pledges of financial support aggregating over \$10,000 have been obtained and a corps of 3 advisers appointed. More than 300 farmers have been visited and advised as to methods, fertilizers, land drainage, seeds and seeding, testing milk, judging and selecting dairy animals, etc., and 442 farmers about general orcharding. The advisers have also aided in purchasing lime and fertilizers, introducing alfalfa and other crops, and forming local organizations. In one of these, the fruit growers' association in Granville, the members have received from \$3.75 to \$4 per barrel for apples this year while nonmembers received from \$2.75 to \$3. Other illustrations of the work are given.

Agricultural credit banks of the world (*Banking Law Jour. Yearbook*, 1913, pp. 40, figs. 12).—A brief but comprehensive discussion of the actual operations of foreign mortgage loan systems and the cooperative agricultural credit system is here presented. Accounts of typical mortgage loan banks are given which serve to illustrate the relation of agriculture to the credit facilities in the various countries.

Cooperative credit associations in Canada, T. K. DOHERTY (*Internat. Inst. Agr. [Rome]*, Mo. Bul. Econ. and Soc. Intel., 4 (1913), No. 6, pp. 16-22).—This article presents a brief summary of the conditions leading to the establishment of cooperative credit banks or associations in Canada, describes their system of administration, and submits a statement as to the amount of business done by a number of them.

There were 98 such associations in the Province of Quebec in 1912, besides several in Ontario. The capital is raised by selling shares and by utilizing the profits. A member's liability does not exceed the limited amount of stock he can hold, and he has but one vote. Loans for purposes which conform with the aims of the association are granted on the note of the borrowing shareholder alone or may be guaranteed by other solvent members. The running expenses of these associations are found to be light, the only official being the business manager, who is paid according to the time he devotes to the work. Further details are presented by notes and tables.

The work of the special agricultural credit institutes in 1912 (*Internat. Inst. Agr. [Rome]*, Mo. Bul. Econ. and Soc. Intel., 4 (1913), No. 10, pp. 55-63).—The work of the special agricultural credit institutes in 11 Provinces of southern Italy and Sicily which under the law of 1911 came under the management of the savings department of the Bank of Naples and the agricultural credit department of the Bank of Sicily, respectively, is briefly summarized.

Tables are given showing amount of loans granted by each institution for various farm operations, together with the security therefor. The operations concluded by the Bank of Naples during the year amounted to 9,353,833 francs, the loans on legal preference mortgages representing 63.42 per cent, those not so secured 30.04 per cent, and those secured on the deposit of agricultural produce 6.49 per cent. Of the total loans 11,736, amounting to 4,327,975 francs, were granted to landholders working their farms, and 6,142, amounting to 2,753,899 francs, to tenant farmers. The agricultural credit department of the Bank of Sicily granted loans during the year to 38,155 intermediary organizations, amounting to 12,025,635 francs.

Tables are given showing the classification and amount of loans according to the different crops and the position of the borrower.

Government valuation of land (*New Zeal. Off. Yearbook 1912, pp. 602-622*).—The various features of the Valuation of Land Act, passed by the New Zealand Government in 1896 and amended in 1908, are described here in detail. The valuation rolls, showing the selling value of all land in the Dominion, are used for taxation purposes as a basis on which loans may be granted by the New Zealand State-guaranteed Advances Office and for the guidance of the Land Purchase Board when acquiring land under the Land for Settlements Act, and by others who may desire to ascertain the selling value of any piece of land for investment, mortgage, etc.

Tables are given showing the capital value of the land with improvements, together with improved values by counties and boroughs, 1878-1912.

Studies of primary cotton market conditions in Oklahoma, W. A. SHERMAN, F. TAYLOR, and C. J. BRAND (*U. S. Dept. Agr. Bul. 36, pp. 36*).—This bulletin presents the results of a market survey made in 103 towns in Oklahoma in which were secured samples of over 3,200 bales of cotton with records of date and place of sale and price paid to the grower. Comparisons are made as to the classification of the grades and the difference in prices paid in some markets on the same day for bales of identical quality. Such variation in prices is shown to have amounted to as much as \$12.50 per bale for low middling cotton. "The greatest losses to the farmers under the present system of marketing appear to lie in their failure to secure the premium for their high grades which these grades finally bring."

Notes and tables are given showing in detail the results of the survey.

An example of successful farm management in southern New York, M. C. BURRITT and J. H. BARRON (*U. S. Dept. Agr. Bul. 32, pp. 24, figs. 5*).—This bulletin describes at length the methods employed by a farmer without previous experience in converting a farm not paying expenses into a profitable enterprise. It gives the method of solving some of the important problems in farm management by improving the dairy, diversifying crops, the use of rotations, and the intelligent use of horse and man labor. Tables are given showing the cost, yield, and income of the various farm operations.

What I know about farming, E. J. GRINNELL (*Minneapolis, Minn., 1913, pp. 328, pls. 37*).—In this book the author discusses, largely from his own experience, various phases of farming and farm life, such as soil fertility and fertilization; the business farmer and his qualification; farm buildings; pastures and meadows; the vegetable garden; corn and small grains; small fruit raising; the orchard; trees and farm forestry; the flower garden; bees; poultry; stock breeding; dairying; frosts and sprays; the woman on the farm; early-day farming in the East; and miscellaneous other subjects.

AGRICULTURAL EDUCATION.

Agricultural and forestry instruction in Italy, A. KASTNER (*Land u. Forstw. Unterrichts Ztg.*, 27 (1913), No. 1-2, pp. 108-128).—An account is given of the present status of agricultural and forestry instruction in Italy administered by (1) agricultural high schools at Milan, Perugia and Portici; (2) royal technical agricultural schools, including the viticultural schools at Alba, Avellino, Cagliari, Catania, and Conegliano; (3) royal agricultural special schools, viz, the Royal Pomological and Horticultural School at Florence, and the Royal Veterinary and Dairy School at Reggio-Emilio; (4) royal practical agricultural schools of which there are 28; (5) 3 private agricultural institutions including the Agricultural Colonial Institute at Florence, and 2 practical schools; (6) agricultural and housekeeping schools for girls; (7) agricultural experimental institutions; (8) itinerant agricultural instruction; (9) traveling agricultural libraries; and (10) the Royal School of Forestry at Vallombrosa, and the Royal School for the Training of Forest Guards at Cittaducale.

[**Agricultural and forestry instruction in Austria and Italy**] (*Land u. Forstw. Unterrichts Ztg.*, 27 (1913), No. 1-2, pp. V+168+LXIX).—In addition to several articles abstracted elsewhere in this issue, this report includes (1) statistics of agricultural education institutions in Austria in 1912-13, showing an addition during the year of 1 agricultural intermediate school, 5 agricultural winter schools, 2 housekeeping schools, an agricultural winter and vegetable culture school, and a school for fruit growing, and the discontinuance of a farm and hop culture school, 2 agricultural winter schools, a housekeeping school, and a brewing school; (2) a review of agricultural literature, and (3) a list of the agricultural and forestry education institutions in Austria with their faculties.

The celebration of the anniversary of the Imperial Royal High School of Agriculture of Vienna (*Land u. Forstw. Unterrichts Ztg.*, 27 (1913), No. 1-2, pp. 1-11).—This is an account of the celebration on May 8 and 9, 1913, of the one-hundredth anniversary of the establishment of the institute for forestry instruction, known later as the forest academy at Mariabrunn, which in 1875 was transferred to the High School of Agriculture of Vienna as the first institute for higher instruction in forestry; also of the fortieth anniversary of the establishment of the High School of Agriculture of Vienna, concerning which a description of its most important periods of development is given.

Report of the department of agriculture of Norway, 1912 (*Aarsber. Offentl. Foranst. Landbr. Fremme*, 1912, III, *Statsforanst.*, pp. LXXXV+35+594).—This report gives a comprehensive survey of the work of the various government agencies established for the advancement of Norwegian agriculture and its various branches. The annual reports of the state agricultural experiment stations, seed control stations, milk control stations, and cow-testing associations are included.

World's dairy schools, trans. by J. H. MONRAD (*N. Y. Produce Rev. and Amer. Cream.*, 36 (1913), Nos. 6, pp. 258, 259; 7, pp. 302, 304; 8, p. 348; 10, p. 430; 11, p. 472).—This condensation of a lecture delivered by Dairy Counselor G. Ellbrecht at the Dalum Dairy School in Denmark gives an account of the facilities for dairy instruction in Norway, Sweden, Finland, Prussia, Holland, Belgium, and Switzerland.

Practical School of Aviculture (*Rev. Vet. e Zootech.*, 3 (1913), No. 4, pp. 257-261).—The objects and methods of instruction of the Practical School of Aviculture of Ascurra in the Federal District of Rio de Janeiro are set forth. The school has an extensive area of land with equipment for an essentially practical instruction. Its object is to train students to direct poultry farms or enterprises, and to become poultry specialists. The students assist in the work

of the farm and each in turn has charge of the various operations in poultry keeping. A 3 months' course is offered, beginning each quarter.

Vocational education, R. O. SMALL (*Amer. School Bd. Jour.*, 47 (1913), No. 4, pp. 12, 13, 55, 56).—According to this article vocational agricultural departments were in operation in 1912 at 5 Massachusetts high schools. Two county high schools and 4 new departments in high schools have since been established. The scheme of agricultural work devised provides productive home-farm operations carried on for profit by the pupils at the same time they are studying the agricultural science bearing upon these operations. During the year 11 different types of farm projects were selected, ranging from a small garden to a dairy in which 12 Jersey cows were handled and money transactions to the extent of \$1.200 engaged in. See also a previous note (E. S. R. 28, p. 106).

The importance, extent, and execution of student practice at agricultural schools (*Land u. Forstw. Unterrichts Ztg.*, 27 (1913), No. 1-2, pp. 18-33).—This symposium of practicums in agricultural schools discusses their use in agricultural intermediate schools (Mittelschulen) by Fritz Schneider; in farm schools by Alois Gross, and in agricultural winter schools by H. Maresch.

Efforts to reform the system of gardening instruction, K. SCHECHNER (*Land u. Forstw. Unterrichts Ztg.*, 27 (1913), No. 1-2, pp. 34-41).—The new management of the Imperial Royal Horticultural Society of Vienna is endeavoring to bring about a reform in the system of gardening instruction in Austria, and as a first step is establishing horticultural apprentice schools, 4 of which are now in operation with good attendance. The principal object of these schools is to extend the technical knowledge and general culture, and to give some commercial training. The instruction is given for 2 years during the 6 winter months, 9 hours a week in 3 periods from 6 to 8 p. m., and on Sundays from 9 to 12 a. m.

There is also a 2-year course in the schools for gardeners' assistants, admission to which requires the completion of the full course of the apprentice schools. Both schools offer practical summer courses in the first year. The first Austrian horticultural week was held from December 9 to 14, 1912, in Vienna, to give experienced gardeners opportunity to learn of the results of recent investigations and experience. Suggestions are also given for the instruction of persons desiring to learn gardening who can not attend school. For the training of horticulturists higher horticultural schools are provided.

Proposals to bring about uniformity in the methods of instruction in the lower agricultural schools with special reference to schools for wine growers, F. JACHIMOWICZ (*Land u. Forstw. Unterrichts Ztg.*, 27 (1913), No. 1-2, pp. 42-54).—The author suggests and discusses as the most feasible and practical school for the majority of farmers a 3-semester school with a small farm and offering temporary spring and summer courses. The 2 winter semesters should each include 30 hours a week of theoretical instruction, and the summer semester should be devoted almost exclusively to practical work.

Farmers' institutes in Kansas, E. C. JOHNSON (*Agr. Ed. [Kans. Agr. Col.]*, 5 (1913), No. 22, pp. 40).—This pamphlet describes briefly the purpose, character, organization, and methods of work of the farmers' institutes in Kansas, and is intended primarily as a handbook for the institute officers.

Suggestive topics for institute meetings are given on soil fertility, soil tillage, the summer fallow, crops, seed and seed selection, crop rotation, weeds, plant diseases, insects, silos and silage, dairying, beef production, farm animals, the orchard and the garden, roads, marketing, cooperation, organizations, tenant farming and labor, farm management, the home, and sociology.

A catechism of agriculture, T. C. ATKESON (*New York and London*, 1913, pp. XII+96, figs. 34).—This work is a revision of that previously noted (E. S.

R., 21, p. 91), considerably enlarged to make a fairly comprehensive treatment of the general field of elementary agriculture. Sections on farm crop management, dairy management, and farm management, have been added, and the work is illustrated for the first time.

A course in agriculture for the high schools of Michigan, W. H. FRENCH (*Mich. Agr. Col., Dept. Agr. Ed. Bul. 11, 1913, pp. 73*).—This course is outlined in detail, together with suggestions and syllabi on the several subjects to be taught. Lists of agricultural reference books, Michigan Station bulletins, sample score cards, and an outline of work in nature study and elementary agriculture, with suggested exercises and experiments that should be undertaken with pupils in the sixth and seventh grades by the high school teacher of agriculture in cooperation with the grade teachers are appended.

The principles of agriculture through the school and the home garden, C. A. STEBBINS (*New York, 1913, pp. XXVIII+380, figs. 199*).—This text has been planned for use in the upper four grades. The features of the book are the "problem questions" and "home studies," information as to profitable marketing, instructions concerning the forming of agricultural clubs, and data on the plan and purposes of the Boys' and Girls' Junior Garden Club.

The method of the book is far removed from merely dogmatic instruction, the pupils being challenged to test and reason. The apparatus required is limited and inexpensive. The language is direct and very evidently has the children in mind.

Practicums for pupils in the chemical laboratory of agricultural intermediate schools, A. KWISDA (*Land u. Forstw. Unterrichts Ztg., 27 (1913), No. 1-2, pp. 12-17*).—The author discusses the object and character of chemical laboratory practicums for pupils in intermediate agricultural schools and outlines such work for a 3-year course.

An old and well-known child's plaything as an expedient in forestry instruction (*Centbl. Gesam. Forstw., 39 (1913), No. 7, pp. 327-332*).—Detailed directions are given for making a miniature model forest for use in forestry instruction.

The story of our trees, MARGARET M. GREGSON (*Cambridge: University Press, 1912, pp. XII+160, figs. 74*).—This book is arranged in 24 lessons, each complete with its own practical work. The lessons are fitted into the natural cycle of seasons, and are also adapted to the school year. A list of reference books and information concerning diagrams and lantern slides, material, and revision questions are appended.

Common trees: How to know them by their leaves, V. M. HILLYER (*Baltimore, Md.: Calvert School [1913], pp. 30, figs. 37*).—This manual is arranged with a descriptive text of each tree family and its members, together with their leaf silhouettes.

The planting of home grounds, V. H. DAVIS (*Agr. Col. Ext. Bul. [Ohio State Univ.], 8 (1913), No. 9, pp. 16, figs. 25*).—The author discusses the extent of grounds, lawns, style, fences, trees, shrubs, and flowers, and points out a number of common errors in treatment. A list of trees, shrubs, etc., that are desirable for Ohio and other States of similar climate is included.

Wisconsin Arbor and Bird Day annual, 1913 (*Madison, Wis.: State Supt. Pub. Instr., 1913, pp. 109, pls. 5, figs. 27*).—The governor's proclamation of May 2, 1913, as Arbor Day is followed by material on forestry, bird life, wild animal life, fire prevention, and good roads, with suggestions on how considerable of this material may be used throughout the year in connection with the regular school branches.

Illinois Arbor and Bird days, F. G. BLAIR (*Ill. Dept. Pub. Instr. Circ. 68, 1913, pp. 71, figs. 54*).—A collection of nature lessons on trees and birds, to-

gether with nature poems, some of which were written by eighth and second-grade pupils.

Arbor Day program, April 25, 1913 (*Boise, Idaho: Dept. Ed., 1913, pp. 13*).—This pamphlet contains the governor's Arbor Day proclamation, suggestions for carrying out the day's program, and hints on tree planting.

Farm arithmetic, C. W. BURKETT and K. D. SWARTZEL (*New York and London, 1913, pp. XIII+280, pl. 1, figs. 122*).—This farm arithmetic is designed for use in the last 2 or 3 years of the elementary school. The problems presented deal with plant and animal feeding, dairy products, the soil, field crops, fruits and vegetables, farm mechanics, silos, forestry, farm accounts, etc. Answers are given to all the problems.

List of references on rural life and culture (*Washington: U. S. Bur. Ed., 1913, pp. 5*).—An annotated bibliography with a list of the periodicals indexed in its preparation.

MISCELLANEOUS.

Twenty-fifth Annual Report of Colorado Station, 1912 (*Colorado Sta. Rpt. 1912, pp. 51*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1912, a report of the director on the work and publications of the station, and departmental and other reports.

Twenty-fifth Annual Report of Massachusetts Station, 1912 (*Massachusetts Sta. Rpt. 1912, pts. 1, pp. 240, pls. 12; 2, pp. 97, pls. 4*).—Part 1 of this report contains the organization list, a list of publications during 1912, a financial statement for the fiscal year ended June 30, 1912, a report of the acting director, departmental reports, and numerous special papers. The experimental work recorded is for the most part abstracted elsewhere in this issue.

Part 2, which is the portion designed for general distribution, consists of papers of a popular nature, abstracted elsewhere in this issue and based on the results of observations and experiments of the station, and of a brief summary by the acting director of the more important conclusions from these articles.

Monthly bulletin of the Western Washington Substation, September, 1913 (*Washington Sta., West. Wash. Sta., Mo. Bul., 1 (1913), No. 1, pp. 16, figs. 4*).—This series has been begun to give information relative to agricultural practice under western Washington conditions. The initial number includes brief articles on the following subjects: Farm Management—Green Forage—Fall Seeding, by H. L. Blanchard; Selection of Potato Seed, and A Cover Crop for the Orchard, by J. L. Stahl; Trap Nests and Their Use, by V. R. McBride; Developing Early Maturing Corn, by B. Stookey; Fair Exhibits of Horticultural and Agricultural Products, by J. L. Stahl and B. Stookey; and Identification of Plant Diseases by Station, Directions for Making Bordeaux Mixture, Black Leg of Potato, and Harvesting and Storing Potatoes with Reference to Disease, by H. L. Rees.

Organization of the Department of Agriculture, 1913 (*U. S. Dept. Agr., Organ. Dept. Agr., 1913, pp. 31*).—This publication describes briefly the work of the various branches of the Department and enumerates the officials responsible therefor.

Organization and conduct of a market service in the Department of Agriculture discussed at a conference held at the Department on April 29, 1913 (*U. S. Dept. Agr., Organ. and Conduct Market Serv. in Dept. Agr., Apr. 29, 1913, pp. 15*).—A summary is given of the proceedings at this conference, including an address by G. H. Powell on The California Citrus Industry, Its Organization and Operation (pp. 2-6), and abstracts of other addresses.

List of free and available publications of the United States Department of Agriculture of interest to farm women (*U. S. Dept. Agr., List Free Pubs. of Interest to Farm Women, 1913, pp. 11*).—About 300 publications, classified by subjects, are listed.

NOTES.

Kansas College and Station.—Work has been begun on the new hog cholera plant to consist of a two-story brick building 60 by 40 feet for laboratories, and an office, a crematory for refuse, and a set of cement hog pens. The cost of the plant will be about \$10,000.

Charles H. Taylor has been appointed in charge of animal husbandry work in the extension division. John W. Calvin, assistant in animal nutrition, has been appointed assistant professor of agricultural chemistry and assistant chemist in the Nebraska University and Station beginning February 1. V. V. Detwiler has been appointed assistant in industrial journalism.

South Dakota College.—Press reports announce that President R. L. Slagle has been appointed president of the University of South Dakota beginning February 1. Dr. O. E. White, formerly instructor in botany and subsequently an assistant and graduate student at the Bussey Institution, has accepted an appointment as plant breeder in the Brooklyn Botanic Garden.

American Association for the Advancement of Science.—At the sixty-fifth meeting of this association, held at Atlanta December 29, 1913 to January 3, 1914, former Dean Bailey of Cornell University was chosen vice-president of Section M, the new section on agriculture. The Society of American Foresters was accepted as an affiliated society. The next meeting of the association will be held in Philadelphia.

Massachusetts Federation for Rural Progress.—This organization was formed at a meeting held at the Massachusetts Agricultural College October 21, 1913, under the auspices of the college, the State Board of Education, the State Grange, and the Western Massachusetts Chamber of Commerce. About 15 organizations participated in the meeting. The constitution, as adopted, provides for a council, an executive committee, and three commissions dealing respectively with farm improvement, marketing and exchange, and community life. President Butterfield of the college was chosen president, Dr. David Snedden, state commissioner of education, vice-president, and E. L. Morgan, community field agent of the college, secretary-treasurer.

Third Congress of Tropical Agriculture.—This congress will be held in London, June 23-30, under the presidency of Prof. Wyndham Dunstan, director of the Imperial Institute. Among the topics to be considered are technical research in tropical agriculture, scientific problems in rubber production, methods of developing cotton cultivation in new countries, problems of fiber production, agriculture in arid countries, and hygiene and preventive medicine in their relation to tropical agriculture. Papers on these subjects may be submitted to, and further information obtained from, the organizing secretaries of the congress, Dr. T. A. Henry and H. Brown, Imperial Institute, London, S. W.

Fifth International Congress of Rice Culture.—This congress is to be held at Valencia, Spain, during the second week in May. It will be divided into sections dealing with the breeding, manuring, culture, and harvesting of rice, rice diseases, commerce in rice, and cooperative methods in rice production and market-

ing. Papers may be submitted in any language, but unless in French, Italian, or Spanish should be accompanied by a summary in Spanish. Additional information may be obtained from the Royal Commissioner of Public Works at Valencia, who will serve as president of the congress.

Agricultural Appropriations in New York State.—Among the special appropriations granted by the New York legislature in 1913 were the following: (1) For the establishment of a state school of agriculture and domestic science at Delhi, \$50,000, (2) for the purchase of lands and erection and equipment of buildings for the New York State School of Agriculture on Long Island, \$190,000, (3) for the maintenance and improvement of buildings of the Schoharie State School of Agriculture at Cobleskill, \$22,800, and (4) for the establishment of a course in practical agriculture at the Plattsburg State Normal School, \$3,500.

The *Rural New Yorker* announces that 3 parcels of land at Farmingdale, Long Island, have been purchased as the site of the new state school of agriculture for Suffolk County at a cost of \$87,000.

State Aid for Agricultural Instruction in Tennessee.—An act of the Tennessee General Assembly of 1913 increases the state school fund from 25 to 33½ per cent of the gross revenues, or by several hundred thousand dollars annually. One of the purposes of this increase is to encourage the introduction of agriculture, home economics, manual training, and kindred subjects into county elementary schools under adequate supervision, through supplementing the salaries of supervisors in these subjects. For the present school year \$10,000 will be available for this purpose, and each supervisor may receive therefrom an amount equal to one-half of the salary provided by the county, but not less than \$200 and not more than \$500.

The act also provides that a portion of the state high school fund may be devoted to the encouragement of these subjects in county high schools. The State Board of Education is authorized to apportion to the high school fund of any county in which the proceeds from the high school tax do not amount to \$2,000 in any one year, the amount necessary to make a high school fund of \$2,000, but not, however, to exceed \$1,500 to any one school in any one year, or a total of \$50,000 for all schools. Counties receiving such aid must comply with the regulations of the State Board of Education with reference to purchases, equipment, licensing of teachers, and courses of study.

High School Visitors in Texas.—The board of regents of the University of Texas has recently made provisions for the employment of high school visitors who will give special attention to the development of manual training, domestic economy, and agriculture. The university now accredits all these subjects for admission to the freshman class.

Agricultural and Home Economics Instruction in the Public Schools of Porto Rico.—A recent number of *Porto Rico Progress* announces that a special teacher in agriculture has been provided for every district in the island except San Juan, and teachers of household economics in 48 towns. To provide time for instruction in agriculture, manual training, home economics and other special subjects, the course of study has been rearranged. Boys in the sixth, seventh, and eighth grades will have 3 periods a week for manual training and 2 for agriculture, while the girls in the same grades will have cooking 3 times a week and sewing the other 2 days. To keep the instruction uniform the Department of Education will send out a monthly bulletin outlining the work in these subjects to be taken daily.

University of Manchester.—The new laboratory for research work in agricultural entomology was opened November 13, 1913, by Sir Sidney Olivier, permanent secretary of the Board of Agriculture and Fisheries. A laboratory

room 58 by 28 feet is available, together with a smaller laboratory, an experimental field with greenhouses, etc. Dr. A. D. Imms, formerly forest entomologist of the government of India, has been appointed first reader in agricultural entomology and will conduct researches and supervise the work of research students.

First Horticultural School for Women in France.—The first horticultural school for women in France, a higher school of horticulture for young women, was opened in the latter part of 1913 at Brie-Comte-Robert, near Paris, under the auspices of the Union for the Agricultural and Horticultural Instruction of Women.

Farm Women's Clubs in France.—The minister of agriculture of France has issued a circular addressed to the directors of the departmental agricultural services authorizing them to organize farm women's clubs in as many communities as possible, for the promotion and dissemination of instruction in home economics and agriculture. These clubs are to supplement the instruction given in the 3 months' courses of the home economics schools now operating in France and in the post-scholastic home economics schools, to aid former students of these schools to perfect their studies and to give women in general an opportunity to procure a professional domestic knowledge.

The clubs of each department are to be federated and these departmental federations combined into a national federation of farm women's clubs, to be administered by a central committee at the seat of the ministry of agriculture.

Pomological Experiment Station in South Russia.—A new experiment station for pomology known as the Salghir Station has recently been established in the Crimea in South Russia in the town of Simpheropol. The director of the station is S. Mokshetsky, entomologist. The station is anxious to enter into relations with the pomological and horticultural institutions of the United States.

Proposed Agricultural College in Ceylon.—Plans are being made for the establishment of a Tropical Agricultural College on the grounds of the Gangarooka Experimental Station, where a tract of 400 acres is available. It is estimated that the main college building and equipment and quarters for the staff and students will cost from 300,000 to 400,000 rupees (\$97,300 to \$129,770.) It is expected that the staff of the Ceylon Department of Agriculture will be available for a portion of the instruction work, but that a botanist will also be needed.

Miscellaneous.—The American Phytopathological Society has elected officers for 1914 as follows: President, Dr. Haven Metcalf of Washington, D. C.; vice-president, Dr. F. D. Kern of State College, Pa.; and counsellor, H. R. Fulton of West Raleigh, N. C.

An association of economic entomologists has been formed in Germany and held its first meeting at Magdeburg the latter part of October, 1913. Dr. L. O. Howard was elected an honorary member.

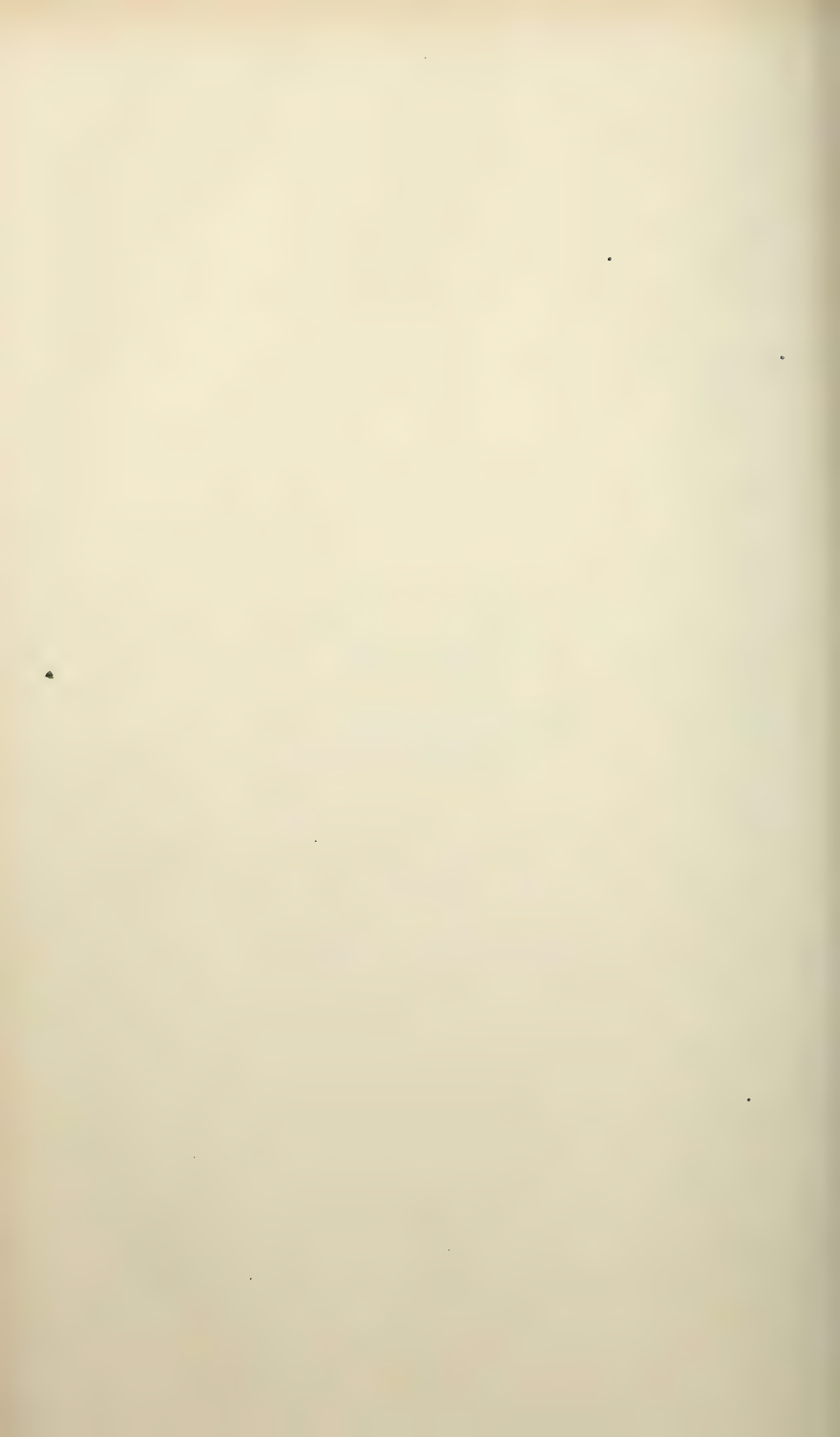
The National Geographic Society has awarded a medal in honor of the late Prof. F. H. King, of the University of Wisconsin, for his well-known work on Chinese agriculture.

Dr. Shosuke Sato, professor and dean of the college of agriculture of Tohoku University, has been designated as the exchange professor of Japan to American universities for 1914.

The Second Annual Conference of Editors of Agricultural Colleges and Experiment Stations will be held at the State University of Kentucky June 25 and 26.

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OF NINE NUMBERS, \$1





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EXPERIMENT STATION RECORD.

VOL. XXX.

ABSTRACT NUMBER.

No. 3.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

Handbook of biochemistry of man and animal, edited by C. OPPENHEIMER (*Handbuch der Biochemie des Menschen und der Tiere. Jena, 1913, sup. vol., pp. XII+746, figs. 33*).—This is a supplementary volume to those already noted (E. S. R., 26, p. 306), and includes the following chapters: The General Significance of the Hydrogen Ion Concentration in Biology (uses in biological problems, the hydrogen ion concentration of the body fluids, etc.), by L. Michaelis; Progress Made in the Field of Protein Chemistry, by P. Rona; Nucleic Acids and their Cleavage Products, by C. Brahm; Morphological Constituents of the Blood and Spermatozoa, by A. Kanitz; The Properties of Hemaglobin, by F. Müller; Oxidation Processes in the Living Tissues (processes in slow combustion, including catalytic phenomena, enzymes of respiration, and the physiological significance of respiratory enzymes), by A. Bach; Gaseous Exchange in Organs, Tissues, and Isolated Cells, by A. Loewy; Anaphylaxis, by E. Seligmann; Biochemistry of the Skin, by P. G. Unna and L. Golodetz; Mechanics of Gastric Secretion, by A. Bickel; Internal Secretions of the Pancreas, by S. Rosenberg; New Investigations in regard to Digestion and Resorption of Foodstuffs, by E. S. London; Fetal Hormones, by B. Wolff; The Nervous System and Internal Secretions, by G. Peritz; Biochemistry and Radio-active Substances, by J. Plesch; The Decomposition of Sugar by the Cell, by C. Neuberg; Biochemistry of Growth of Man and other Higher Animals, by H. Aron; Metabolism and Sexuality of the Female, by L. Zuntz; and Parenteral Protein Metabolism, by W. Caspari.

Handbook of biochemical methods, edited by E. ABERHALDEN (*Handbuch der Biochemischen Arbeitsmethoden. Berlin and Vienna, 1913, vol. 7, pp. XXVIII+912, figs. 198*).—This is the seventh volume of this work (E. S. R., 29, p. 408), and contains the following chapters: The living animal material for biochemical investigations (selecting, obtaining, and keeping under various conditions); the use of secretin for obtaining pancreatic juice; the detection and preparation of methylated amino acids (betains) in animal and vegetable tissues; preparation of some substances of biochemical importance from molasses and molasses slops; the most important methods for examining foods and condiments (a very extensive chapter); the technique of investigating the respiratory gaseous exchange in healthy and diseased subjects; the precipitins and methods of precipitation; the methods of investigating the biochemically important actions of light; microscopic technique; some rapid methods for the examination of blood in urine; the quantitative determination of chlorin ions in blood; the

preparation and detection of glucosids; researches with radio-active rays; and movement of gas and water in the plant (transpiration, root pressure, etc.).

Discussions of the Eighth International Congress of Applied Chemistry (*Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York], 27 (1912), pp. XIII+190*).—This includes the discussions of the various sections, among them analytical, inorganic, agricultural, and organic chemistry; industry and chemistry of sugar; India rubber and plastics; fermentation; fats, fatty oils, and soaps; paints, drying oils, and varnishes; starch, cellulose, and paper; hygiene; pharmaceutical chemistry; bromatology; biochemistry, including pharmacology; electrochemistry; and law and legislation affecting chemical industry.

Researches on cellulose, C. F. CROSS and E. J. BEVAN (*New York, London, and Bombay, vols. 2, 1906, pp. XI+184; 3, 1912, pp. X+173*).—These are the second and third reports on this topic (E. S. R., 13, p. 916). Volume 2 deals with cellulose as a typical colloid; cellulose as a chemical individual; cellulose and structural forms—dimensions; nitric esters; aceto-sulphates; cellulose-xanthogenic acid; cellulose and alkaline hydrates; theory of dyeing; electrolytic phenomena; constitution of cellulose; hydrocellulose; mixed esters—chloracetyl derivatives of hydrocelluloses, etc.; animal digestion and assimilation of cellulose; destructive fermentations; and technical progress in cellulose industries, and a general forecast of technological developments.

Volume 3 deals with cellulose in relation to biological science; its constitution; cellulose esters, acetate, and comparative studies of acetylation, formyl derivatives, and xanthogenic esters; lignocelluloses, reactions with halogens, constitution, and study of autoxidation; technical developments, textile industries (bleaching, paper making, and commercial jute and "heart-damage"); special industries; artificial fibers, film products, and applications of cellulose acetates. The use of bastol, a product made by treating sawdust with aqueous sulphurous acid, and which is used as a constituent of some cattle feeds in England is also discussed.

Relation of the reducing power to the fermentative capacity of various carbohydrates, E. SCHLICHTING (*Abs. in Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York], 26 (1912), Sects. VIa-XIb, p. 83*).—The paper gives the results of a large number of experiments from which the author has drawn the following conclusions:

"(1) All results found for the amount of actual fermentable sugars by the fermentation method are generally too low, and form about 1 to 6 per cent less than the real amount of sugars present, excepting in mixtures of equal parts of saccharose and dextrose. (2) Fermentation methods of sugar determination should be invariably carried out with pure cultures of yeasts, under uniform conditions of time, temperature, nature, and quantity of yeast nutrients. (3) Certain real relations undoubtedly exist between the reducing power and the fermentability of sugars which enable the analyst to find the correct amount of fermentable sugars, especially when only 2 carbohydrates (of those mentioned) are present. (4) When more than 2 sugars are present in the solution, the results found for fermentable sugars by their reducing power are from 3 to 6 per cent in excess of the truth."

On koji acid, a new organic acid formed by *Aspergillus oryzae*, T. YABUTA (*Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York], 25 (1912), Sects. I-Ve, pp. 455-462*).—Large quantities of an acid obtained from *A. oryzae* grown on steamed rice were prepared. Saito has previously described this acid as β -resorcylic-carbonic acid. The empirical formula for the recrystallization product was found by this investigator to be $C_{12}H_{14}O_8$. "From the copper salt, as well as from the acetyl and benzoyl derivatives, the presence of 2 carboxyl and 4 hydroxyl groups in the molecule has also been ascertained, so that

the formula may be written as $C_{10}H_8(OH_4)(COOH)_2$. It is therefore quite different from β -resorcylic-carbonic acid, and so far as the author knows, the occurrence of such an acid in fungi has never been mentioned before." The name kojic acid has since been given to the substance.

In regard to the proteolytic activity of taka-diastrase, OLGA SZÁNTÓ (*Biochem. Ztschr.*, 43 (1912), No. 1-2, pp. 31-43).—The results show that acids in small concentrations affect the action of taka-diastrase, mineral acids having the least effect. Compared with trypsin, it is more susceptible to organic acids, and hydrochloric acid destroys it more quickly.

Inhibition is less by alkalis than by acids, and alkalis do not destroy it. Salts do not, or only slightly, inhibit its action. Neutral salts, such as sodium chlorid, sodium sulphate, and sodium nitrate, do not affect it, but inhibit the activity of trypsin. The same effect was noted with most organic salts, but not with sodium lactate. Dextrose, lactose, and starch do not affect it, while levulose shows a slight inhibition of its activity.

The nature and function of the plant oxidases, E. D. CLARK (*Torreya*, 11 (1911), Nos. 2, pp. 23-31; 3, pp. 55-61; 4, pp. 84-92; 5, pp. 101-110).—"The oxidases are of very wide distribution among the flowering plants, peroxidases, especially, being present in about 75 per cent of all the specimens examined, while oxygenases (direct oxidases) are less widely distributed, being found in one-half of the plants used. Catalase may be said to be universally distributed, since there were only a few cases in which it was not found. The leaves, stems, roots, and food-storage organs of the plants seemed to contain the greatest amounts of the oxidases. The flowers and fruit were in many cases comparatively poor in oxidases. In regard to the fruits this statement must be qualified, because dry seeds of somewhat uncertain age were the only available material of certain species.

"Our experience with a great many parallel tests, using the different oxidase reagents upon a great variety of vegetable tissues, show that all of the reagents seem to detect the same substance or substances, for if one reagent gave a positive test, the others generally acted in like manner. The phenolphthalein and indophenol reagents gave positive results in more cases than the others. This is undoubtedly due to their greater ease of oxidation, for they are spontaneously oxidized by the air. It is probable that in the presence of acid juices in the plant the latter does not form oxidases or else that they are immediately destroyed by the acid. It was shown that the inhibiting effect of acids upon the action of oxidases seemed to be a function of the concentration of the hydrogen ions.

"Among plants the chromogens are found to the greatest extent in certain orders, such as the Liliales, Orchidales, Ranales, and most frequently of all in the latex plants of the Convolvulaceæ, Boraginaceæ, Labiate, Solanaceæ, Rubiaceæ, Compositæ, etc. Active oxidases are also likely to be associated with chromogens in the latex plants. These conclusions are interesting because of the bearing they have upon Palladin's theory that these chromogens play an important part in the respiration and the metabolism of plants."

A comprehensive review of the literature of the oxidases is included.

Investigations in regard to phosphatase, H. VON EULER (*Abh. in Chem. Ztg.*, 36 (1912), No. 138, p. 1353).—This enzyme has the property of combining inorganic phosphoric acid with carbohydrates, forming an organic phosphoric acid ester, glucophose. Glucophose was cleaved both in the intestine and kidney, and was synthesized with extracts of these organs.

Glucophose is considered a catalyzer for sugar cleavage by living yeast and also an intermediary product of this reaction. Judging from this phenomenon it seems reasonable to assume that the cleavage of sugar in the animal organ-

ism occurs in the same way. The reason that we have not been able to determine the specific enzyme bringing about the cleavage of sugar is probably because a number of enzymes are concerned in the process; furthermore, the enzymes are localized in various organs, consequently the cleavage of sugar in the body occurs in various phases. When the equilibrium of one of these phases is destroyed, a sort of diabetes occurs.

Glucophose gives us a means for determining in what part of the cycle sugar combustion is abnormal. With it the weakest phase of the process may possibly be enhanced. Living yeast is incapable of producing glucophose but when phosphatase is liberated from the cell it synthesizes this compound.

The problem of enzyme synthesis.—I, Lipase and fat of animal tissues, H. C. BRADLEY (*Jour. Biol. Chem.*, 13 (1913), No. 4, pp. 407-418, figs. 2).—These tests, which were made with the tissues and fluids of the fish, cat, dog, calf, goat, and adult bovine, indicate that "no broad correlation exists between the fat and lipase content of tissues. Homologous organs in allied species, such as teleost livers, fish muscles, etc., show no parallelism between fat and enzyme. Some of the most active fat-producing tissues are relatively poorer in lipase than many other tissues which never normally contain or produce more than a small percentage of fat. Active mammary tissue affords the most striking example of this when compared with lung, kidney, and muscle tissues." "Instead of being unusually rich in lipase on account of its active secretion of fat, it is found to be about on a par with such other tissues as fish ovaries and testes, spleen, brain, and other gland structures of mammals and invertebrates. Compared with a large number of tissues, active mammary gland is not a tissue rich in lipase; it is only twice as active as blood itself. The fact that active mammary tissue is richer in lipase than inactive, as was pointed out by Loevenhart, is probably due in large measure to its hyperplastic condition during lactation."

"Quantitative comparison of fat and lipase in animal tissues gives no positive evidence in support of the theory of enzyme synthesis."

The problem of enzyme synthesis.—II, Diastase and glycogen of animal tissues, H. C. BRADLEY and E. KELLERSBERGER (*Jour. Biol. Chem.*, 13 (1913), No. 4, pp. 419-423).—The results confirm the findings of H. MacLean,^a who showed that kidney and lungs usually low in glycogen had a high diastatic power. The work was done with the lower form of animals, fish, crustaceans, etc., which are known to be rich in glycogen.

The problem of enzyme synthesis.—IV, Lactase of the mammary gland, H. C. BRADLEY (*Jour. Biol. Chem.*, 13 (1913), No. 4, pp. 431-439).—The results show that the active mammary gland of cats, goats, and rabbits contains no lactose-destroying enzyme. In two cases (goat and cow) there seemed to be a progressive increase of sugar, especially when blood was added to the mixture. This may be due to the presence of a mother (pro) substance as indicated by Porcher (*E. S. R.*, 17, p. 287). Lactase, according to this, does not seem to be responsible for the lactose present in milk.

Contributions to our knowledge of the vegetable hemagglutinins, R. KOBERT (*Landw. Vers. Stat.*, 79-80 (1913), pp. 97-205).—This discusses the chemical nature of ricin and its preparation; the agglutination reaction and its use for detecting castor-bean meal in feed cakes; the chemical nature of antiricin; castor-bean lipase and its action; the action of ricin upon animals; the detection of ricin in feeds which contain other agglutinins and in those stuffs which contain no other agglutinins; croton, abrin, and robin from common locust seed (*Robinia pseudacacia*), and phasin from other sources; papilionaceous

^a Bio-chem. Jour., 4 (1909), No. 10, pp. 467-479.

plants in which hemolysins instead of phasins are present; and pseudoagglutination.

The analysis of rare earths and earth acids, R. J. MEYER and O. HAUSER (*Die Analyse der seltenen Erden und der Erdsäuren. Stuttgart, 1912, pp. 320, figs. 14*).—This book is divided into a qualitative and a quantitative section, and is devoted to the analysis of rare earths and their acids. It constitutes the fourteenth and fifteenth volumes of B. M. Margosches' series of books on analytical chemistry.

Application of the ammonium carbonate method for the determination of humus to Hawaiian soils, J. B. RATHER (*Jour. Indus. and Engin. Chem., 5 (1913), No. 3, pp. 222, 223*).—After commenting upon what has been reported by Kelley and McGeorge (*E. S. R., 27, p. 7*), it is stated that "the ammonium carbonate method for the removal of clay from humus solutions has given uniformly good results on a number of the soil types of the United States, but on exceptional soils, like some of those of Hawaii, a slight modification of the method is necessary to remove the clay. The modification consists essentially in increasing the amount of ammonium carbonate to 2 gm. per hundred cubic centimeters, and heating for 1 hour."

The determination of colloids in cultivated soils, C. HASSLER (*Sitzber. Naturhist. Ver. Preuss. Rheinlande u. Westfalens, 1911, Nos. 1, Sect. C, pp. 13, 14; 2, Sect. C, pp. 15-24, fig. 1*).—Previously noted from another source (*E. S. R., 26, p. 519*).

Loss of fat as a result of drying meat, M. TAMURA (*Biochem. Ztschr., 41 (1912), No. 1-2, pp. 78-101; abs. in Zentbl. Biochem. u. Biophys., 13 (1912), No. 14-15, p. 567*).—As a result of drying and powdering meat, a loss of fat takes place. The larger the amount of meat, the greater the loss. If alcohol is added during the drying, the loss of fat is considerably reduced.

It is deemed advisable, when working according to Shimidzu's paste method or the powder method, to use no more than 300 gm. of material at one time.

Determination of fat in bread, G. GRUJIC (*Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York], 26 (1912), Sects. VIa-XIb, pp. 1-3*).—The usual methods proposed for extracting the fat in foods can not be applied to the estimation of fat in bread. Previous drying or finely grinding the sample does not increase the yield of fat, but by extracting the crumb of entirely fresh bread, other than rye bread, almost all of the fat present is extracted. The procedure recommended for all kinds of bread, including old bread, is the following, which is based on Polenske's method:

Five gm. of bread crumbs, moist or previously ground dry, is placed in a 200 cc. flask supplied with a condensing tube, mixed with 50 cc. of water and 2 cc. of a 25 per cent solution of hydrochloric acid (specific gravity 1.125), and heated for 1½ hours in a boiling water bath. After cooling, 1 cc. of a 0.04 per cent solution of methyl orange is added, neutralized with concentrated alkali, acidified with 1 drop of dilute hydrochloric acid, filtered through a small folded filter, and the residue washed with hot water. The filter with its contents is then spread on a watch glass, dried for 2 hours at 105° C., and extracted in a Soxhlet apparatus for 6 hours with ether.

The results obtained with rye bread, white bread, and baked goods prepared with skim and whole milk compare very well with the fat present in the flour from which the products were made.

The polarimetric determination of starch in potatoes, F. HERLES (*Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York], 26 (1912), Sects. VIa-XIb, pp. 5-10*).—Estimating the amount of starch present in potatoes by the specific gravity method leaves much to be desired, while the methods

depending upon the conversion of the starch into sugar are cumbersome. The polarimetric methods seem to be the most appropriate for this purpose.

For the solution of the starch, the author utilizes hydrochloric acid, which was first pointed out by Effront. A fine paste is prepared of the potatoes with a beet press or chopping machine, and 8.82 gm. (for Mohr's cubic centimeters) or 8.8 gm. (for metric cubic centimeters) of the paste is brought into a 100 cc. flask with the aid of 25 cc. of water, and amid stirring 25 cc. of fuming hydrochloric acid (specific gravity 1.188) is added. The mixture is allowed to stand for about 1 hour, stirring frequently during the interval, and then water is added to make 100.35 cc. This is shaken, filtered, and polarized at 20° C. with a Ventzke-Soleil polariscope. The reading obtained gives the percentage of starch present.

A more rapid method consists of weighing out 9.55 gm. (Mohr's cubic centimeters) or 9.53 gm. (metric cubic centimeters) of the potato paste into a beaker glass. The weighing glass is washed off with 25 cc. of water, dried with a piece of filter paper, and the paper thrown into the beaker; 25 cc. of fuming hydrochloric acid is then added, stirring constantly during the process. This is allowed to stand for 1 hour, stirring the mass during this period, when 50 cc. of water is added, shaken, filtered, and polarized as before.

The specific gravity of citrus fruit as a factor in the separation of frozen fruit, R. A. GOULD (*Abs. in Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York], 26 (1912), Sects. VIa-XIb, p. 387*).—This reports briefly the results of determining the floaters among 5 varieties of sound oranges and 2 varieties of sound cured lemons. The fruit was floated on alcoholic solutions of various strengths and specific gravities.

"The specific gravity varies with the growing district, the variety, the size, and the time of picking. The limits of variation are too great to allow of the use of any method, dependent upon the specific gravity of the fruit, for the accurate commercial separation of frozen from sound fruit, although any lot of partly frozen fruit can be bettered by proper treatment in alcoholic solutions of the proper gravity."

Tables showing results of attempted separation by floating fruit in 160 proof alcohol and subsequently putting that fruit which floats under diminished pressure and refloating in the same solution are given, also tables showing proximate analyses of sound and frozen oranges of various specific gravities to show additional factors which influence the specific gravity of the fruit.

Honey examination, H. WITTE (*Ztschr. Öffentl. Chem., 18 (1912), Nos. 19, pp. 362-373; 20, pp. 390-397*).—A discussion as to the value of determining the nonsaccharin substances, ash, acidity, saccharose, the presence of Ley's reaction, albuminate, the precipitation according to Lund, the presence of starch sirup, Fiehe's test, Auzinger's reaction, and Thöni's precipitation reaction for judging honey. The complete protocol resulting from the analyses of 53 various kinds of honey is given.

Determination of sucrose in confectionery containing cooked starch and in marshmallows, C. C. ROBERTS (*Abs. in Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York], 25 (1912), Sects. I-Ve, p. 539*).—After pointing out the difficulties encountered in clarifying solutions of starch paste confectionery and marshmallows, a method is recommended in which dilute alcohol (made by diluting 400 cc. of commercial alcohol to 1,000 cc. with water) is used as a solvent for the sucrose. The normal weight, 26.048 gm. of an average sample of the confectionery, is treated with some of the dilute alcohol until solution has taken place, transferred to a 200 cc. flask, clarified with a solution of subacetate of lead (specific gravity 1.25) or alumina cream, or both,

made up to volume with dilute alcohol, and filtered. The filtrate is then polarized as usual.

For inversion 50 cc. of the filtrate is evaporated to remove the alcohol and then inverted in the usual manner. The sucrose is calculated by Clerget's formula.

A method for the detection of color in tea, E. ALBERTA READ (*Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York], 18 (1912), Sect. VIIIC, pp. 301-303*).—The method described below was devised for the purpose of detecting color in tea, inasmuch as the chemical methods suggested by Allen, Leach, Villiers, and Collin, and the International Committee for the Unification of Analytical Methods for Food-products can not be used without difficulty where small quantities of color are present, largely because of the masking effect produced by the natural color of the tea. The proposed method has the advantage that it will detect much smaller amounts than are found by the chemical method, although it overlooks traces of color which would be found with a compound microscope. It can be used by persons unskilled in scientific methods, and has the additional advantage of being rapid.

"The articles needed for testing the tea are sieves, 16 to 24 meshes to the centimeter, a spatula or case knife, and a piece of unglazed white paper. A small amount of tea, about 25 to 50 gm., is placed in a sieve and shaken over a piece of white paper. If the tea is tightly rolled, it should be slightly crushed either before putting into the sieve or by rubbing it against the sieve. The dust on the paper is then crushed by dragging over it a spatula or case knife, pressure being applied by the finger to the end of the spatula. This crushes not only the tea dust, but any particles of color which are present. The process of dragging the knife across the paper streaks the color, making it more easily seen. A lens with a magnification of 8 to 12 diameters is useful in detecting the smaller streaks. Sunlight is desirable; bright light is essential for this work. This method will detect any coloring as blue, tumeric or carbon." It can also be employed for determining whether tea has been faced, but instead of the white paper, black, unglazed paper is used, on which the facing leaves a white streak.

The chloral hydrate test for charlock, A. L. WINTON (*Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York], 26 (1912), Sects. VIIA-XIB, pp. 409-411*).—For general use the following reagent and procedure is proposed:

"Dissolve 16 gm. of crystallized chloral hydrate in 10 cc. of water. To the solution add 1 cc. of concentrated hydrochloric acid. In making the test, mount about 10 mg. of the mustard flour (or an equivalent amount of prepared mustard) on a slide in the reagent, heat cautiously (never to boiling) for a moment, and examine under a lens. Note the proportion of fragments of hulls that acquire a carmin red color (charlock) to those not changed in color."

Progress made in the chemistry of milk and dairy products during the year 1911, M. SIEGFELD (*Chem. Ztg., 36 (1912), Nos. 140, pp. 1369, 1370; 141, pp. 1378, 1379; 143, pp. 1394, 1395*).—This deals with the advances made in regard to the chemistry, physiology, and technology of milk and other dairy products. The topics are dealt with under the headings of physiology, general chemistry of milk proteins, fats, sugar, ash, enzymes, tests for detecting heated milk, and cream, butter, and milk preparations.

New method for determining fat in cheese by the acid method without the use of amyl alcohol, W. D. KOOPER (*Milchw. Zentbl., 41 (1912), No. 24, pp. 753-757*).—It is a well-known fact that the use of amyl alcohol is undesirable, particularly because it forms compounds with some of the cheese particles

which go over into the fat in varying amounts. Accordingly, a method is proposed which does away with the use of amyl alcohol and at the same time is easy to operate, is exact, uses a low concentration of sulphuric acid, and is not influenced by high temperatures.

In the method 6.5 cc. each of sulphuric acid of specific gravities 1.54 and 1.82 are used. After adding the weaker acid, the butyrometer is heated in a water bath at the temperature of boiling water until the cheese has been dissolved; then the stronger acid is added. After the solution shows a light brown to violet coloration, it is centrifuged at 1,000 revolutions per minute for 5 minutes, placed in the water bath at 70° C. for a short time, and the fat column read off. It is necessary that the fat be clear, that no plug formation has taken place, and that the color of the fat is a faint pink to a very light brown.

The results of examining 20 different kinds of cheese in various stages of ripeness are given, and compared with the results obtained by the gravimetric method.

New acid-butyrometric method for determining fat in cheese and dairy products, HAMMERSCHMIDT (*Milchw. Zentbl.*, 41 (1912), No. 24, pp. 757-763, fig. 1).—The author noted that when sulphuric acid was allowed to act upon amyl alcohol a compound was formed which was finally calculated as fat in the acid-butyrometric method. Amyl alcohol can also go over into the fat as such and cause certain errors in the final calculation.

In order to eliminate the use of amyl alcohol or acetic acid, which is employed in some methods, the author has previously reported on a modification of the Burstert (E. S. R., 21, p. 523) method. Not finding this method suitable on account of the cumbersome apparatus which it employs, he has now devised a new method which can be used with an apparatus similar to the butyrometer. He found that when certain criteria are adhered to in regard to decomposing casein, the casein may be dissolved in a special solution of borax (strength not given). If sulphuric acid and amyl alcohol are then carefully added, satisfactory results are obtained.

A number of analyses were made of cheese, the results of which are reported.

Estimation of fat in cheese by the "neu-sal" method, O. WENDLER (*Milchw. Zentbl.*, 41 (1912), No. 24, pp. 763-765).—A description of a new butyrometer for estimating fat in cheese. The solvent used is composed of a salicylate and hyposulphite. For clarifying the fat butyl alcohol is employed.

On the relationship between the weight of the sugar beet and the composition of its juice, J. A. HARRIS and R. A. GORTNER (*Jour. Indus. and Engin. Chem.*, 5 (1913), No. 3, pp. 192-195, figs. 3).—It is believed that the relation of the size of beet to sugar yield has been too little studied. The studies have been conducted, the authors believe, by inadequate methods, and consequently it seemed of importance to measure the intensity of this relationship on the -1 to +1 scale of the coefficient of correlation; also to write the regression equations showing the absolute change in solids, sugar, or purity, associated with a unit change in weight of the beet.

"Suitable published data seem all but wanting. In many series the weights given are averages, without specification as to the number of beets included. Analyses have been made by the thousands, and in some cases upon uniform material drawn from the same cultural conditions, but [the authors] have not been able to obtain such records, either published or in manuscript."

The data analyzed by statistical methods were obtained from Bulletin 39 of the Division of Chemistry of this Department (E. S. R., 5, p. 1004), and Bulletin 32 of the Nevada Experiment Station (E. S. R., 9, p. 349). The beets considered were Klein Wanzlebener, Improved Klein Wanzlebener, Vesbesserten Klein Wanzlebener, Vilmorin Ameliorée, and Desparez.

"Considering the shortness of the materials upon which they are based, these results are surprisingly consistent throughout. They show that composition and purity are very closely correlated with weight, and in such a way that as weight increases, total solids, sucrose, and percentage purity fall rapidly. The rate of fall on the relative scale of -1 to $+1$ is shown by the coefficient of correlation r , the rate in an absolute scale by the second term of the regression equation."

Graphs of most of the equations were prepared, and while the empirical means are very irregular, there is no evidence to show that the regression is other than linear.

The amount of nitrogen in beets and molasses during the years 1907-1911, SAILLARD (*Bul. Soc. Nat. Agr. France*, 72 (1912), No. 6, pp. 545-550).—The methods of sampling and analyzing beets are described. The beets harvested in 1911 were found to contain much more total albuminoid, ammoniacal, amido, and injurious nitrogen than has been observed in previous years. This is supposed to be due to the dry season. A large amount of nitrogen in beets has a tendency to reduce the sugar yield and to increase the yield of molasses. Certain technical difficulties are also encountered in the use of beets high in nitrogenous substances.

Quantitative determination of the bitter substances of hops, L. ADLER (*Ztschr. Gesam. Brauw.*, 35 (1912), No. 35, pp. 406-410; *abs. in Jour. Soc. Chem. Indus.*, 31 (1912), No. 20, p. 1003).—This is a modification of Lintner's method (*E. S. R.*, 11, p. 22), and consists of boiling 10 gm. of hops, previously disintegrated in a chopping machine, for 7 hours with 200 cc. of petroleum ether (boiling point 48° C.). After cooling, the extract is made up to 255 cc., and 50 cc. of the filtered liquid is titrated with tenth-normal potassium hydroxid solution, using 10 drops of a 1 per cent solution of phenolphthalein as the indicator. The titration is finished when the yellowish brown layer, after thoroughly shaking, has a carmin red tint. The volume of tenth-normal alkali solution used, multiplied by 2, gives the percentage of bitter substances present in the hops. If necessary, the boiling point of petroleum ether can be adjusted to 48° by adding benzin, etc. A variation of 10° in the boiling point, however, was found to make a difference of only 0.5 per cent in the bitter substances.

The detection and estimation of arachis oil, N. EVERS (*Analyst*, 37 (1912), No. 440, pp. 487-492).—The method recommended for the estimation of arachis (peanut) oil is as follows:

"Weigh out 5 gm. of the oil into a saponification flask, and 25 cc. of alcoholic potash (80 gm. potash dissolved in 80 cc. water and diluted to a liter with 90 per cent alcohol), and saponify for about 5 minutes under a reflux condenser. To the hot soap solution add 7.5 cc. of acetic acid (1 volume of glacial acetic acid to 2 volumes of water) and 100 cc. of 70 per cent alcohol containing 1 per cent (by volume) of hydrochloric acid, and cool to 12 to 14° C. for an hour. Filter and wash with 70 per cent alcohol containing 1 per cent hydrochloric acid at 17 to 19° , the precipitate being broken up occasionally by means of a platinum wire bent into a loop. The washing is continued until the filtrate gives no turbidity with water, the washings being measured. Dissolve the precipitate, according to its bulk in 25 to 70 cc. of hot 90 per cent alcohol, and cool to a fixed temperature between 15 and 20° . If crystals appear in any quantity, allow to stand at this temperature for 1 to 3 hours, filter, wash with a measured volume of 90 per cent alcohol (about half the volume used for crystallization), and finally with 50 cc. of 70 per cent alcohol. Wash the crystals with warm ether into a weighed flask, distill off the ether, dry at 100° , and weigh. If the melting point is lower than 71° , recrystallize from 90 per cent alcohol. Add the correction for the solubility in 90 per cent alcohol as in Renard's

process from the table given by Archbutt (Allen's Commercial Organic Analysis, 4. ed., vol. 2, p. 94), and also for the total volume of 70 per cent alcohol used in precipitating and washing (including the 100 cc. added in the first instance).

"If there are no crystals from 90 per cent alcohol, or if they are only in very small amount, add a sufficient quantity of water to reduce the strength of the alcohol to 70 per cent (31 cc. water to 100 cc. 90 per cent alcohol). Crystallize at 17 to 19° for an hour, filter, wash with 70 per cent alcohol, and weigh as before, adding the correction for 70 per cent alcohol. If the melting point is below 71°, recrystallize from a small quantity of 90 per cent alcohol, or again from 70 per cent alcohol.

"The following oils gave no crystals: Olive oils, including 'nice superfine,' 'nice seconds,' 'Malaga,' and 8 of unknown origin, almond, poppy, and rape oils."

A clinical method of estimating the amount of calcium in the urine and other physiological fluids, W. B. BELL (*Bio-chem. Jour.*, 6 (1912), No. 3, pp. 205-209, figs. 2).—Finding that the precipitates obtained with oxalic and acetic acids for many specimens of urine were pure calcium oxalate, providing the proper precautions as regards phosphates were observed, a method was devised for determining the calcium in urine and similar fluids.

"A sample from a 24 hours' specimen of urine is made faintly acid with hydrochloric acid to dissolve any insoluble phosphate present. It is then made faintly alkaline with ammonia, and filtered. Next 5 cc. of the filtrate is placed with a pipette in the special centrifuge tube, which is of the usual size and shape in the upper portion, but tapers at the lower end into a cylindrical extremity of even bore (1.25 mm.) and calibrated into 1 mm. divisions. A line, with 'urine' marked below it, encircles the upper part of the tube at the 5 cc. level. Any air bubbles which may collect in the calibrated portion are got rid of with a fine wire or strand of silkworm gut. Then 1 cc. of the reagent, consisting of a saturated solution of oxalic acid in a 5 per cent solution of acetic acid, is added. The correct quantity of reagent (1 cc.) is also indicated by a line round the tube, which is marked 'reagent.' Finally 2 cc. of alcohol or methylated spirit, as indicated by the line marked 'alcohol,' is added, and the contents of the tube are thoroughly mixed by shaking.

"The second tube is then taken, and 5 cc. of the standard solution (0.05 gm. of calcium phosphate, $\text{Ca}_3(\text{PO}_4)_2$, is dissolved in a little hydrochloric acid. Make alkaline with ammonia and acid with acetic acid. Add 2 gm. of urea to the solution, and dilute the whole up to 100 cc. with distilled water; specific gravity, 1.015) is run into it with a pipette that is up to the line marked 'solution,' and any air bubbles removed as before. Next the reagent and alcohol are added, as in the case of the first tube, and the whole is thoroughly shaken. Both tubes, with their calibrated end packed in wool, are then carefully placed in the opposite buckets of a centrifuge, and are centrifuged for about a quarter of an hour. On removing the tubes the precipitate will be found to stand at a certain height, say 10 mm. in the 'standard-solution' tube, while it may stand at 7 mm. in the other, which contains the urine to be examined. As a rule, there is a slight slant on the surface of the deposit. This can be obviated by stopping the machine at the end of 1 or 2 minutes and turning the tubes through half a circle."

When the method was compared with the usual chemical method for determining calcium it was found that the greatest difference never amounted to more than 1 per cent of the quantity present in the sample.

A new method for detecting methyl alcohol, P. N. RAIKAW (*Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York], 25 (1912), Sects. I-Ve, pp. 417-419*).—The method is based on the behavior of nitromethan and

its immediate homologues toward sodium nitroprussid in an alkaline (ammoniacal) solution. If a few drops of sodium nitroprussid are added to a solution containing nitromethan an indigo blue coloration is produced.

A procedure for applying this test for the detection of denatured alcohol is also described.

METEOROLOGY—WATER.

On some meteorological conditions controlling nocturnal radiation, J. R. SUTTON (*Trans. Roy. Soc. So. Africa*, 2 (1912), pt. 5, pp. 381-393).—This paper is based upon observations at Kimberley during a period of 8 years with 2 radiation (spirit) thermometers, one placed upon the grass and the other mounted on a light brass stand 5 in. above the grass.

The general conclusion reached is "that after allowance has been made for the state of the sky and the movement of the air, the only factor of real importance determining the magnitude of the radiation-temperature gradient is the relative humidity. The absolute humidity, as such, is unimportant."

Some causes and effects of variation in the range of temperature, J. R. and ELIZABETH M. SUTTON (*Trans. Roy. Soc. So. Africa*, 2 (1912), pt. 4, pp. 341-356).—This paper presents the results of a study of what variation if any of the diurnal curve of barometric pressure accompanies a greater or less range of temperature as night follows day.

Nitrogen in rain and snow, N. KNIGHT (*Proc. Iowa Acad. Sci.*, 18 (1911), pp. 75-77).—The results of analyses with reference to the nitrogen content of 9 samples of snow and 8 samples of rain collected at Mount Vernon, Iowa, during 8 months, excluding May, June, July, and August, of 1910 are given. The total amount of nitrogen brought down to the soil by precipitation during this period was 13.71 lbs. per acre.

Dry season and droughts in Rhodesia, E. GOETZ (*Rhodesia Agr. Jour.*, 10 (1913), Nos. 4, pp. 538-544; 5, pp. 691-698; 6, pp. 828-832).—The rainfall throughout Rhodesia during the dry season for a number of years is summarized and the conclusion is reached that there is no useful rainfall from April to October, inclusive. Droughts of more or less severity also occur during the so-called rainy season, a fortnight or more without rain or 20 to 25 days with not more than $\frac{1}{2}$ in. of rain being considered a drought. The distribution of droughts throughout the year for a series of years is shown. Changes in farm practice better to adapt them to weather conditions are discussed.

The regime of underground waters in the neighborhood of Polesia, E. V. OPROKOV (*Pochvovîdînié (Pédologie)*, 15 (1913), No. 2-3, pp. 29-57, pl. 1).—Nine years' observations are reported on ground water level and the factors affecting it made on three wells in the immediate neighborhood of Polesia in the Province of Minsk. The variations in ground water level and the effects of atmospheric precipitation, evaporation, and temperature on its position are graphically represented.

From his observations the author concludes that the atmospheric precipitations have a marked influence on the height of ground water level, which is manifested within a short time, generally not more than a month after precipitation during the warm months. He further concludes that the sinking of the ground water level during the dry years was due entirely to loss by evaporation, etc., that the rise of water level during the wet years was due to the recuperation of the average quantity of soil moisture during the rainy periods following the dry periods, and also that the excess water of a rainy year is held in reserve for the dry year or years following.

Water supplies, with special reference to underground water, L. K. WARD (*Jour. Dept. Agr. So. Aust.*, 17 (1913), No. 4, pp. 494-504).—Referring especially

to South Australian conditions the author briefly discusses rainfall, its use and loss, artesian water, artesian basins, the salt content of rain, ground water, well types, factors determining quantity and quality of water, well location and protection, tanks, and the use of the divining rod. Observations made in New Zealand are said to prove that every inch of rain falling over an acre of ground deposited $4\frac{1}{2}$ lbs. of salt.

The advice of a geologist is considered preferable to that of a diviner in locating underground water supplies.

SOILS—FERTILIZERS.

The geology of soils and substrata with special reference to agriculture, estates, and sanitation, H. B. WOODWARD (*London and New York, 1912, pp. XVI+366, pls. 4, figs. 44; rev. in Science, n. ser., 38 (1913), No. 983, pp. 626, 627*).—This book gives an outline of geology in its broader relations with agriculture and sanitation, and discusses the preparation of geological maps and soil surveys; soils, subsoils, and substrata; weathering of rocks and subsidences; the climatic conditions affecting soils and their handling; chemical composition and physical properties of soils; the use of mineral fertilizers and amendments; forests and woodlands, and their associated geological features; orchards, gardens, and vineyards; geological considerations concerning minerals and other economic materials; house sites, water supply, sewage, and drainage; and geological formations of England in their relation to the above subjects.

The object of the book is stated to be "to provide such information relating to the land-surface as will be useful to students and teachers of agriculture, to those occupied in the management of estates and farms, or in sanitary and engineering works, wherein it is important to consider the geological nature of different sites for residences and other purposes." Special emphasis is laid on the importance of a knowledge of the underlying formations in the study of soils. It is maintained that a soil map to be of most value must deal not only with the surface soil, but must take into account the subsoil and show the depth as well as the nature of the soil. "A map of the surface soils alone would give a very imperfect idea of the capabilities of the land. . . . A good subsoil map which shows the variations in the strata, whether drifts or the more regularly stratified formations, will always indicate the general distribution of the surface soils."

The germs of pedology in antiquity, A. JARILOW (*Internat. Mitt. Bodenk., 3 (1913), No. 2-3, pp. 240-256*).—This article reviews the ancient ideas regarding biology and physics of soils.

Progress in agricultural chemistry (especially soil chemistry) since the use of the newer results of physical chemistry, especially colloid chemistry, H. BREHM (*Kolloid Ztschr., 13 (1913), No. 1, pp. 19-35*).—This article discusses in some detail the significance of colloid chemistry in relation to soils, mineralogy, and geology. The chief soil colloids enumerated are humus, slime organisms, colloidal iron and aluminum hydroxids, weathered amorphous silicates, and bacteria and micro-organisms held in suspension. The chemistry of colloidal humus in soils and the influence of lime and humus on the adsorptive power of cultivated soils are taken up in turn, followed by reviews of numerous works on the quantitative determination of soil and decomposed rock colloids.

It is thought that colloids play an important part in the exchange of bases when plant food is added to the soil by entering into the so-called adsorption combinations which are essentially different from ordinary chemical combinations. These colloidal cementing substances or adsorption combinations are

considered to be the food bearers of the soil. Too much or too little of the colloidal substances is said to impair the agricultural value of a soil.

The possibility of judging soils by their natural vegetation on the basis of the theory of probability, P. VAGELER (*Pflanzer*, 9 (1913), No. 4, pp. 171-184; *abs. in Chem. Zentbl.*, 1913, II, No. 4, pp. 378, 379).—From a mathematical demonstration, based on the assumption that the quantitative relations between soil and plants depend primarily on the physical properties of the soil, especially its hygroscopicity, it is concluded that the theory of probability combined with rigorous adjustment of the errors of probability is applicable for judging soils whose types of physical structure and plant forms lie within certain extreme limits established by actual test. This method was tested using hygroscopic values of some of the representative extreme soil formations of German East Africa, having correspondingly distinct vegetation.

It is concluded in general, from results obtained, that plant forms are regulated by those physical properties of the soil which regulate the hygroscopic water, and that under the same conditions of climate and with the same plant forms the same soil properties will appear with a regularity which will vary practically as indicated by the numerical probability error. It is further concluded that this method not only places the judging of soils by their characteristic vegetation on an exact numerical basis and reduces the number of actual tests, but offers a useful method for tracing soils in open plain areas.

Soil texture, C. T. GIMINGHAM (*Chem. World*, 2 (1913), No. 6, pp. 187, 188).—The opinion is expressed that from all points of view the mechanical analysis serves as a good basis for the classification of soils, but that the results of such analysis can be of use only with a full knowledge of local conditions since the textures of identical soil types often vary from field to field. In this connection it is suggested that the percentage of shrinkage of soils on drying be determined.

White soil (Molkenboden), R. HORNBERGER (*Internat. Mitt. Bodenk.*, 3 (1913), No. 4, pp. 353-357).—The author reports his own and reviews other investigations on a rather impermeable grayish white soil, which he concludes is derived from sandstone but is somewhat poorer in soluble potash and lime and richer in phosphoric acid than an ordinary sandy loam derived from sandstone.

Marsh of the southern Vendée.—The influence of inundation on the fertility, G. CHARTRON (*Bul. Soc. Sci. Nat. Ouest France*, 3. ser., 2 (1912), No. 3-4, pp. 125-132).—In discussing the fertility of the soils of these flats it is stated that in the spring a kind of alga grows in the stagnant drainage water on the flats, forming a slime coating on the soil after the water has disappeared which is said to vary in amount from 214 to 1,158 lbs. per acre. Analyses of samples show considerable nitrogen and lime but relatively little phosphoric acid and potash. Analyses of soils from the surrounding slopes and of the drainage water lead to the conclusion that the fertility of the swamp soils is due more to the drainage water than to the slime.

Preliminary report on the soils of the wine district of Arad-Hegyalja and of the Arad plains, P. TREITZ (*Jahresber. K. Ungar. Geol. Reichsanst.*, 1910, pp. 214-243).—A discussion of geology and meteorology in their relations to the soil formations of these regions is followed by descriptions of the different types of soil encountered in both hill and plains country. The soils of the hill country are divided into soils rich in humus and iron, calcareous soils, brown forest soils, and podzol soils. The plain soils are discussed as sand and gravel soils, light brown and dark brown desert soils, prairie clay, and alkaline soils.

The soils of the rocky deserts of Turkestan, S. S. NEUSTRUEV (*Pochvovédénie (Pédologie)*, 15 (1913), No. 1, pp. 1-19).—This article discusses in some detail the geological formations of the rocky deserts of Turkestan in their

relation to climate, vegetation, and soil formation. Analyses of some of the soils of these regions show large quantities of gypsum, less sodium sulphate, and some sodium chlorid. The quantity of sodium sulphate is said to be sufficient to limit the vegetation to desert plants. An abundance of gypsum is observed principally where excess moisture is contained in the soil. For this reason the salt deposits are said to be due to the evaporation of atmospheric water and not to subterranean waters, although the formation of underlying salt crusts under the influence of subterranean waters is frequent.

Tamar River soils, H. J. COLBOURN (*Agr. and Stock Dept. Tasmania, Rpt. 1912-13, pp. 18, 19*).—Analyses of basaltic and nonbasaltic soils from the Tamar River Valley are reported with brief comments on their fertilizer needs.

Soil formation in clays of humid regions, B. FROSTERUS (*Internat. Mitt. Bodenk., 3 (1913), No. 2-3, pp. 99-130, figs. 11*).—Investigations of the physical and chemical composition of podzol soils found in clay soil deposits in swampy regions are reported. These included a study and comparison of the different layers of these soils and the conditions which determine their character.

It was found that in many cases two genetically different divisions exist in podzol soils, an upper and a lower. The upper part, which may be considered the podzol proper, is divided into two zones, one composed of layers of humus and of kaolin, the other composed of sedimentary earth and ortstein (hardpan) formations. These layers are formed by the leaching down of the soils from above. The kaolin layer is in an advanced state of weathering and is characterized by a high silica content. The layers of the second zone are especially rich in humus, clay and iron, and leachings of magnesia and alkalis.

The location and condition of the lower part of the podzol soil is determined by the ground-water level, and in some cases this influence extends to the surface soil, giving rise to the so-called ground-water soils. In localities where the ground-water level is high and where forest swamps are common such soils take an important place, replacing the true podzol soils. Where they lie near the surface they exercise a bad influence on plant growth. The true podzol formation is directly opposed to the ground-water soil formation.

The constituents of clay which impart plasticity and cohesion, A. ATTERBERG (*Internat. Mitt. Bodenk., 3 (1913), No. 4, pp. 291-330, figs. 2*).—In a report of extensive investigations of the causes of plasticity, toughness, and firmness of clays of northern and southern Europe the author defines plasticity, consistency, and stickiness as applied to clay, reviews the investigations and conclusions of other experimenters, and reports the results of his own tests of a large number of mineral samples and chemical preparations made to determine the principal plastic constituents in these clays. The minerals biotite, hematite, and limonite, and mixtures of hematite or limonite with kaolin showed typical clay plasticity combined with a high degree of toughness, as did also ferric oxychlorid (dialyzed iron).

Those minerals and preparations which appeared plastic showed a leafy or scaly structure from which it is concluded that the particles of leafy or scaly form impart plasticity to a mineral. A high degree of toughness was found in washed products of biotite, hematite, and limonite, as was also a high degree of firmness on drying in fine washed products out of the same materials. Since firmness was not found in all of these products it is concluded that a high degree of firmness is a property only of the scaly shaped particles of colloidal size.

Since the clays of northern Europe contain biotite in both oxidized and unchanged form it is generally concluded that colloidal biotite washings form their chief constituent and explain their high plasticity. The clays of southern Europe apparently owe their plasticity to their high content of hematite and limonite and mixed hematite or limonite with kaolin.

Comparative investigations of the cohesive power of different kinds of soils, H. PUCHNER (*Internat. Mitt. Bodenk.*, 3 (1913), No. 2-3, pp. 141-239, figs. 2).—The author describes methods and apparatus used and gives the results of tests of the cohesive power of a large number of soil samples from different depths.

A summary of results indicates that the samples tested showed wide variations in cohesive power, which in the great majority of cases was more marked in the upper strata of soil than in the deeper ones. Investigations on the effect of mechanical composition of soils on their cohesive power showed that coherence increased with a decrease of the coarse sand and an increase of fine silt. The coarser silt (0.01 to 0.25 mm.) increased cohesive power in coarse-grained soils with an excess of sand. On the other hand, too large a proportion of the coarser silt in fine-grained soils decreased the cohesive power. The sand separates of different grades (0.25 to 3 mm.) generally decreased cohesive power. The cohesive power of dry soils was affected to a considerable extent by chemical and biological influences as well as by the physical properties of the individual soil constituents.

Physico-chemical studies of soils.—II, The hygroscopicity of soils, U. PRATOLONGO (*Staz. Sper. Agr. Ital.*, 46 (1913), No. 3, pp. 219-240, pls. 3, figs. 2).—In a systematic study of the hygroscopicity of six soils, it was found by physical and mechanical analyses and by a determination of variations in water vapor tension in the soil under fixed and variable temperatures that the physical and chemical structure as well as the humus content of the soils directly affected the processes of dehydration and rehydration.

Relation between the hygroscopicity and the chemical composition of certain Java soils, J. SCHUIT (*Meded. Proefstat. Java-Suikerindus.*, 4 (1913), No. 10, pp. 225, 226, table 1, pl. 1; *Arch. Suikerindus. Nederland. Indië*, 21 (1913), No. 24, pp. 713, 714, pl. 1, table 1; *abs. in Chem. Abs.*, 7 (1913), No. 21, p. 3635).—By hygroscopicity of the soil is here understood the number of grams of water which 100 gm. of oven-dry soil absorbs in 14 days in vacuum over 10 per cent sulphuric acid. With such of the soils as had hygroscopicity of less than 10.5 there was remarkable regularity in that the moisture, the organic matter, the nitrogen, and the lime rose with the hygroscopicity and the phosphoric acid soluble in hydrochloric acid and that soluble in citric acid fell, while the potash dissolved by these two solvents first rose, then fell. With soils showing a hygroscopicity above 10.5 the same relation was observed in the first named constituents, while with the phosphoric acid and the potash there was less regularity.

Quantitative determination of the absorbed bases in the soil, D. PRANISCHNIKOW (*Landw. Vers. Stat.*, 79-80 (1913), pp. 667-680, pl. 1, fig. 1; *abs. in Zentbl. Agr. Chem.*, 42 (1913), No. 5, pp. 296-298).—Under the assumption that soil constituents are in the form of available plant food only when in an absorbed condition, experiments were made to determine the efficiencies of ammonium nitrite, acetate, hydroxid, carbonate, and chlorid for determining the quantities of available potassium in soils. The nitrite showed a stronger reaction than the chlorid, but was considered unsatisfactory on account of its unstable character. In this respect the acetate and hydroxid gave better results than the nitrite, although the energies of reaction were about the same. The carbonate was less suitable on account of the organic matter in the soils.

For determining quantities of available ammonia four methods were compared, as already noted by Reschetnikov (*E. S. R.*, 28, p. 111).

A rich black soil, a loam, and a podzol soil were treated with ammonium nitrate to determine the quantity of absorbed lime. The rich black soil was

found to be fairly rich in lime while the other two were comparatively poor, especially the podzol.

In tests of certain potassium-containing silicates as sources of available potassium, biotite, muscovite, and nepheline when treated with ammonium chlorid and barium chlorid showed relatively large quantities of available potassium while orthoclase, sanidin, microclin, and leucite were very poor in this respect. However, it is stated that a quantitative comparison can not be made by these results since the different potassium silicates and zeolites are said to be in variable states of stability regarding potassium. An artificial sodium zeolite was treated with potassium and ammonium chlorids in order to get the corresponding potassium and ammonium zeolites. Pot tests with buckwheat of these and other silicates showed that the potassium in the zeolites, as also in the biotite and nepheline, was largely in available form, but this was not so when the zeolites were protected from contact and reaction with the other plant food salts, a strong fixation of the potassium being apparent. In this case the addition of calcium carbonate worked satisfactorily in converting the potassium compounds into available form as did also mixtures of the salts of other foods.

The so-called isolation method was used to test the effect of the various silicates when not in contact with other plant food compounds in the soil. In this method two concentric cylinders are used, the inner being much smaller and somewhat shorter than the outer. Some of the roots of the plant are placed in the inner cylinder which is filled with sand containing only the silicate to be tested. The rest of the roots are allowed to grow in the sand which fills the outer cylinder to the top and is supplied with all necessary elements of plant food except that added to the inner cylinder. The top of the latter is closed so that there is no interchange of plant food between the cylinders. In this way the plant was forced to draw its potash supply from the silicate in the inner cylinder without the aid of the solvent action of other fertilizing substances.

Experimental investigations on the question of precipitation of iron in podzol soils, B. AARNIO (*Internat. Mitt. Bodenk.*, 3 (1913), No. 2-3, pp. 131-140).—Experiments made to determine the movements of iron in podzol soils showed that it moves in such soils in ferrous forms reduced from ferric salts by humus solutions and as iron colloid solutions in soil solutions which are poor in electrolytes and show a high humus content, as is the case in sandy podzol soils. The iron sinks into the deeper layers of such soils and forms ortstein when conditions are favorable for precipitation. It is also shown that iron can be precipitated by electrolytes, of which sulphuric acid and silicic acid are the most prevalent in this soil, and by colloidal silicic acid and humus. The electrolytes and colloids are said to effect precipitation only within fixed limits of concentration of the solution to be precipitated. The colloid iron is said to diffuse through the upper part of the soil and is there precipitated by humus and electrolytes. This explains the presence of so much iron in the upper layers of podzol soils.

Iron in the ground water in the form of salts of mineral acids rises through capillarity and is precipitated in the upper layers of the soil.

Work of the chemical laboratory of the Ploti Experiment Station, 1912, S. SKALSKIĬ (*Godichnyiŭ Otchet Ploti. Selsk. Khoz. Opytn. Stantsii*, 18 (1912), pp. 133-227, 349-380, pls. 3).—The work reported included bacteriological as well as chemical studies of the soil. The intensity of the process of the fixation of nitrogen in the soil under different cultural conditions; the intensity of the processes of nitrification and denitrification in tilled and untilled fallow; and the conversion of easily soluble phosphoric acid into insoluble form under the influence of chemical and microbiological factors were studied in field and

laboratory. In addition, a series of cropping experiments was conducted to determine (1) the influence of sterilized soils on the development of plants and (2) the proportions of nitrogen and phosphoric acid most favorable for plant development. Studies were also made of the relation of nitrogen and phosphoric acid to soil fertility.

The fixation of nitrogen by soil bacteria was found to depend on the cultural condition of the soil, the intensity of the process increasing with the degree of culture. It was higher in spring (tilled) fallow soil than in untilled, and higher in the surface soil than in the subsoil of all the soils tested.

Determination from time to time of nitric nitrogen in soil and subsoil indicated that the intensity of nitrification was much less in the cultivated top soil than in the subsoil of both tilled and untilled fallow except for a few days at the beginning of the tests, while the opposite was true of denitrification. Studies of the processes of nitrification and denitrification in identical samples of soil, however, indicated that when conditions were made favorable in the soil for the growth and activity of nitrifying bacteria a medium was formed with the resulting nitrates which was favorable to the growth and activity of denitrifying bacteria which in turn destroyed the nitrates already formed. It was further found that some of the nitric nitrogen formed was converted into albuminoids or into gaseous nitrogen. Some of the latter may be fixed by nitrogen-fixing organisms and pass into complex organic forms.

In addition to the results obtained in the preceding year in regard to the chemical and microbiological fixation of soluble phosphoric acid (E. S. R., 28, p. 417) it was found that the fixation of easily soluble phosphoric acid depends as much on chemical as on biological factors, and the intensity of this process depends directly on the cultural condition of the soil. The total fixation through both chemical and microbiological factors was found to be greater in subsoils than in cultivated top soils as was also the case where the fixation was due to chemical factors alone, but when due to microbiological factors alone the intensity was found to be the greater in the top soil.

Sterilization of soils with chloroform and with heat, as previously noted, increased the crop yield by converting the phosphoric acid and nitrogen into available forms. The crop yield increased with the nitrogen added; but with increased phosphoric acid there was first an increase, then a decrease. Increasing both fertilizers slightly increased the crop.

Fallow soil was found to be in the best physical and chemical condition, and phosphoric acid was more needed as a fertilizer in this soil than nitrogen, although both are considered indispensable in raising the soil to a high degree of fertility.

Bacterial action in the soil as a function of food concentration and of insoluble organic substance, O. RAHN (*Centbl. Bakt. [etc.]*, 2. Abt., 38 (1913), No. 19-20, pp. 484-494).—This work is a continuation and completion of studies previously noted (E. S. R., 29, p. 817), and is devoted chiefly to a study of the influence of porous spongy substances, such as cellulose, on bacterial activity in soils. Cellulose in the form of finely grated filter paper was mixed with sand, washed with hydrochloric acid, in different proportions. These mixtures and likewise sand without cellulose were moistened with a 5 per cent peptone solution, and a peptone solution without sand addition was also used in each series. These different combinations were sterilized in the autoclave and inoculated with a culture of *Bacillus mycoides*. The cultures were analyzed after 2, 4, 6, 10, and 20 days' incubation and the progress of decomposition and the different speeds of transformation in the individual combinations noted. The influence of the concentration of peptone and of variations in water content and of cellulose on the ammonification are specially noted.

From the results obtained it is concluded that the bacterial activity in soil depends on the size of soil grains, the water content, and the concentration of food. The speed and the final stage of decomposition vary with these three factors.

In order to obtain physiologically comparable results it is shown that the soil solution must contain the same food concentration in all experiments, which does not correspond with conditions in cultivated soil. With the same food concentration in the soil the decomposition of some substances shows approximately under all conditions the same final point of cleavage, so that only the speed of decomposition and not the final stage is influenced by the size of grain and water content. This was found to be the case in the decomposition of peptone by *B. mycoides*. However, with other bacteria in previous experiments the speed of decomposition and also the point of final decomposition were influenced by the physical properties of the soil.

Coarse spongy organic substances, such as decomposed cellulose, acted in dry soils as water absorbers and diminished the bacterial action, but in moist soils they increased ventilation and thereby increased the activity of aerobic bacteria.

Occurrence of *Azotobacter* in tropical soils, J. GROENEWEGE (*Meded. Proefstat. Java-Suikerindus.*, 4 (1913), No. 13, pp. 241-244; *Arch. Suikerindus. Nederland. Indië*, 21 (1913), No. 26, pp. 790-793; *abs. in Chem. Abs.*, 7 (1913), No. 21, p. 3635).—Contrary to the conclusions of De Kruffy, the author found *Azotobacter chroococcum* in all but one of a series of Java soils, and in this the chlorin content was 3.86 per cent, indicating sufficient sodium chlorid to kill the bacteria. *Bacillus radiobacter* was also found to be generally present in Java soils.

Methods in soil bacteriology.—VI, Ammonification in soil and in solution, F. LÖHNIS and H. H. GREEN (*Centbl. Bakt. [etc.]*, 2. Abt., 37 (1913), No. 22-25, pp. 534-562; *abs. in Jour. Chem. Soc. [London]*, 104 (1913), No. 609, I, pp. 797, 798; *Chem. Abs.*, 7 (1913), No. 19, pp. 3380, 3381).—This is a critical study of the factors affecting ammonification and nitrification of blood meal, flesh meal, and horn meal under laboratory conditions. It is considered that in determining the relative value of laboratory tests in soil and solution media the specific mode of application of methods must be clearly defined, since widely varying results may be obtained in both cases according to variation in the experimental conditions. "The most significant cause of variation appears to be that of aeration."

Ammonification, as well as nitrification, proceeded much more rapidly under aerobic than under anaerobic conditions. It is believed that aerobic conditions especially favor the later stages of breakdown resulting in the formation of ammonia itself. Under conditions of insufficient aeration, increasing the quantity of nitrogenous material used retarded the ammonification, but with adequate aeration it had little influence. In general smaller quantities of material experienced more complete ammonification although the chemical nature of the material used seemed to be the dominant factor. The duration of the experiment affected the apparent extent of ammonification, the rate of ammonification being in general greatest during the first ten days in both soil and solution. The three materials used showed very different rates of decomposition.

In solution tests the losses of ammonia by evaporation were highest and the relative extent of ammonia assimilation lowest with the larger quantities of material. In these tests the use of magnesium hydrogen phosphate effected marked conservation of ammonia only in the longer periods of decomposition. However, the ammonia not lost through evaporation was assimilated by the

bacteria. In solution tests the depth of liquid was found to be the chief factor in controlling aeration, while in soil tests the depth of soil layer and the degree of moisture exercised relatively little effect within comparatively wide limits. However, where the depth of the soil layer interferes with aeration marked differences are said to appear.

In solution nitrification was not observed in the presence of the three materials used, while in soil tests with liberal aeration and not too large an excess of ammonia it kept pace with ammonification. There was accumulation of ammonia with the larger quantities of material but not with the smaller. In the longer periods the ammonia accumulated during the earlier stages was partly nitrified and partly lost by evaporation. With inadequate aeration there was no formation of nitrate.

The metabolism of flesh meal proceeded almost as fast in solution as in soil, while horn meal and blood meal decomposed much more rapidly in soil.

Nitrate and nitrite assimilation, O. BAUDISCH (*Ztschr. Angew. Chem.*, 26 (1913), No. 83, *Aufsatzteil*, pp. 612, 613).—The author attempts to show in this article that the nitroxyl group plays an important rôle in nitrogen changes in green plants, and discusses the ways in which this is done.

Studies on the decomposition of cellulose in manures and soils, C. MÜTTERLEIN (*Studien über die Zersetzung der Zellulose im Dünger und Boden*. [Inaug. Diss.] Leipzig, 1913; *abs. in Centbl. Bakt. [etc.]*, 2. Abt., 39 (1913), No. 4-7, pp. 167-169).—The work of other investigators on this subject is reviewed and a series of experiments with different culture media and various inoculating materials is reported.

The effect of toluol and CS_2 upon the micro-flora and fauna of the soil, P. L. GAINES (*Missouri Bot. Gard. Ann. Rpt.*, 23 (1912), pp. 147-169; *abs. in Centbl. Bakt. [etc.]*, 2. Abt., 39 (1913), No. 4-7, p. 158).—The results of the investigations reported in this article are summarized as follows:

"(1) Small quantities of CS_2 , toluol, and chloroform, such as have been used practically and experimentally, when applied to the soils studied exert a stimulative rather than a diminishing effect upon the total number of bacteria present.

"(2) An application of such quantities of CS_2 and toluol does not have an appreciable effect upon the number of types of protozoa present in such soils as have been studied.

"(3) A very marked increase in yield may be noted following such an application when no evident change occurs in total number of bacteria present.

"(4) In the light of the recent work of Koch, Egorov, Goodsey, Fred, and others, with results presented in this paper, the theory advanced by Russell and Hutchinson to account for the increased yield following the application of such chemicals appears not tenable for general application."

The influence of fertilization on the condition of the soil and its fitness for certain crops, A. MAUSBERG (*Landw. Jahrb.*, 45 (1913), No. 1, pp. 29-101).—Studies conducted for 18 years on the relations between the properties of a soil and its fertilization and productiveness are reported, and methods of physical, mechanical, and chemical analyses, and of eliminating errors are reviewed. The tested soil was originally a medium heavy, deep loam, mostly fine grained, with a hygroscopicity of about 2.98 per cent and an absorption coefficient for ammonia of 72.5 mg. It contained relatively small quantities of plant food, although needing only moderate potash and very little phosphoric acid fertilization.

In experiments made to determine the influence of varied fertilization on the physical, mechanical, chemical, and biological properties, it was found that soil

not fertilized for a long period became rather dense in structure, suffered during drought, became saturated and sticky during wet weather, dried very slowly, and showed little useful bacterial activity. Its alkalinity was also low.

Continuous treatment with either sodium nitrate or kainit produced a dense, crusted structure and reduced the basicity and the useful bacterial action. Continued ammonium sulphate treatment had a detrimental effect on the soil reaction and bacterial activity. Continuous lime treatment produced all the characteristics of high fertility, with the exception of impoverishment in potash, as did also the magnesia treatment to a little less degree.

Complete fertilization without lime produced results in no way inferior to those produced by continuous lime treatment. There was a most marked exhaustion of potash with complete fertilization except potash. Mixed fertilization with stable manure, mineral phosphates, and potash produced only a medium physical structure and somewhat better bacterial activity, but reduced the alkalinity.

Rye, oats, peas, potatoes, and sugar beets were grown on differently fertilized plats. Winter rye appeared to thrive on all the soils regardless of fertilization, little difference being observed on different plats. Oats required an excess of easily assimilable nitrogen, which it preferred as sodium nitrate. Aside from nitrogen the oats required sufficient potash.

For a good yield of peas, both potash and lime were necessary, the absence of either causing the same shortage in yield as the absence of both. Potatoes thrived best with plenty of potash, and preferred ammonium sulphate to sodium nitrate as a source of nitrogen. A change in soil reaction affected them but little, as complete fertilization without lime and with magnesia did not decrease the yield. The highest yield of potatoes was obtained with mixed fertilization of stable manure, mineral potash, and phosphate fertilizers in spite of the low alkalinity of the soil.

For a good yield, sugar beets required each of (1) easily assimilable nitrogen, (2) sufficient potash, (3) high alkalinity in connection with a satisfactory soil structure, and the yield decreased in proportion to the deficiency of any of these three. The beets stood in direct contrast with potatoes, since, in spite of the presence of magnesia, they were badly affected by a deficiency of lime and preferred sodium nitrate to ammonium sulphate as a source of nitrogen.

Fertilization had a more lasting influence on the starch content of potatoes than on the sugar content of beets, but although both depended largely on potash, an excess of this reduced the quality of the potatoes and improved that of the beets. Phosphoric acid had little effect on the yield of either, but ammonium sulphate increased the carbohydrate formation in both.

Experiences with commercial fertilizers and manure, W. LONERGAN (*Ann. Rpt. Nebr. Corn Improvers' Assoc.*, 4 (1913), pp. 85, 86).—Experiments with manure and fertilizers on a good clay upland soil in Nebraska led to the conclusion that the use of manure was superior to all other treatments, and that there was little or no advantage in the use of commercial fertilizers on such soils.

Fertilizer experiments on peaty meadows in Hungary, J. GYÁRFÁS (*Köztelek [Budapest]*, 23 (1913), No. 43, pp. 1553, 1554; *abs. in Internat. Inst. Agr. [Rome]*, *Mo. Bul. Agr. Intel. and Plant Diseases*, 4 (1913), No. 8, pp. 1194, 1195).—Cooperative experiments in different parts of Hungary showed in general that the use of a fertilizer containing phosphoric acid and potash gave highly remunerative results.

The results of experience with fertilizers during the last twenty-five years, LEMMERMANN (*Illus. Landw. Ztg.*, 33 (1913), No. 48, pp. 450, 451).—This is a brief review of German experience and shows that the free use of fertilizers

has been a large factor in increasing agricultural production in that country. In fact, 50 per cent of the increase, which has been very pronounced, is attributed to the rational use of fertilizers.

Bone products and manures, T. LAMBERT (*London, 1913, 2. rev. ed., pp. VII+167, figs. 17*).—This is a second revised edition of this work (E. S. R., 13, p. 634).

The solubility of soil constituents, H. FISCHER (*Internat. Mitt. Bodenk., 3 (1913), No. 4, pp. 331-337, fig. 1*).—In a comparison of the solubility of phonolite and biotite in water saturated with carbon dioxid according to the Mitscherlich method it was found that the potash of the latter was less soluble than that of the former. This, however, is not in accord with results of crop tests by other investigators which showed that the potash of biotite is more readily assimilated by oats than that of phonolite. Methods of rendering the potash of phonolite more assimilable by plants are briefly discussed.

Comparative manuring experiments with crushed phonolite and 40 per cent potash salts, F. WAGNER (*Prakt. Bl. Pflanzenbau u. Schutz, n. ser., 11 (1913), Nos. 4, pp. 52-53; 5, pp. 67-70; 6, pp. 77-82, fig. 1; abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 4 (1913), No. 10, pp. 1534, 1535*).—Ground phonolite was compared with 40 per cent potash salt on hops grown on soils poor in potash. The phonolite was used in connection with a basal fertilizer of ammonium sulphate, Thomas slag, and lime, but the results from its use were in no way comparable with those obtained with the potash salt.

The possibility of replacing Stassfurt potash salts by finely ground phonolite, leucite, etc., LEMMERMANN (*Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 4 (1913), No. 10, pp. 1483-1495*).—Experiments with various natural silicates of potash are reviewed.

It is shown that the fertilizing effect of these is variable, but generally low. They are not comparable with potash salts. Various processes which have been proposed for the improvement of their assimilability are noted, but it is held that none of them offers a practical substitute for the German potash salts.

Influence of the condition of the soil on the utilization of different phosphates, H. R. CHRISTENSEN (*Fühling's Landw. Ztg., 62 (1913), No. 11, pp. 392-405*).—Experiments are reported which were conducted to determine the relative values of superphosphate, Thomas slag, bone meal, and Algerian phosphate fertilizers under varying conditions of cultivated and meadow soils, the variable factors being the power of the soils to set free acids, especially phosphoric acid, the moisture content, and the basicity.

On cultivated soils the effects of the superphosphate and Thomas slag were uniformly good, and both were utilized in practically the same quantities in acid and basic soils, the Thomas slag being utilized slightly the more. Using superphosphate as a standard, the results with bone meal and Algerian phosphate were poor. With a single exception it was found that the utilization of the phosphoric acid of bone meal as compared with that of superphosphate was very small in basic soils, while in nonbasic and acid soils the two were utilized to about the same extent. No definite relations were found to exist between the acid separating powers of cultivated soils and the utilization of the four phosphates.

In meadow soils superphosphate was utilized to a somewhat greater extent than Thomas slag, the utilization of Thomas slag being greatest in the basic soils. Bone meal, with one exception, was not utilized so well as superphosphate. Better utilization of bone meal was found on moist than on dry soils with greater acid separating powers. The effect of basicity on bone meal was not so marked as in the cultivated soils.

It is concluded that the utilization of slowly soluble phosphates is largely regulated by the amount of water present in the soil during the growing season, being greater in moist than in dry soil, and also that bone meal can not be satisfactorily used on basic soils. Although little tested, Algerian phosphate is classed with bone meal.

Origin of the hard rock phosphates of Florida, E. H. SELLARDS (*Fla. Geol. Survey Ann. Rpt.*, 5 (1912), pp. 23-80, pls. 10).—The nature and location of the hard rock phosphate deposits are described and theories of their origin are discussed.

As regards the origin of these deposits the author holds "that the matrix of the hard rock phosphate deposits is the residue of the formations that have disintegrated in situ, and that the phosphate itself is derived from the phosphate originally widely disseminated through these formations, circulating waters being the agency by which the phosphate has been carried to its present location."

An extensive bibliography of the subject is given.

Production of phosphate rock in Florida during 1912, E. H. SELLARDS (*Fla. Geol. Survey Ann. Rpt.*, 5 (1912), pp. 291-294).—The statistics of production of different kinds of phosphate rock in Florida in 1912 and several preceding years are summarized. A list of phosphate manufacturing companies operating in the State during that year is also given.

Consumption of superphosphates in Hungary, B. KOVÁCSY (*Közeleik [Budapest]*, 23 (1913), No. 42, pp. 1532, 1533; *abs. in Internat. Inst. Agr. [Rome]*, Mo. Bul. Agr. Intl. and Plant Diseases, 4 (1913), No. 8, p. 1201).—The data reported show a marked increase in the consumption of commercial fertilizers, especially superphosphates, which constitute 80 per cent of the total amount of chemical fertilizers employed. The use of superphosphate varies from $\frac{1}{2}$ to 72 lbs. per acre of cultivated area in different parts of the country.

Calcium pyrophosphate, A. MENOZZI (*Indus. Chim.*, 13 (1913), pp. 261, 262; *abs. in Jour. Soc. Chem. Indus.*, 32 (1913), No. 19, p. 953).—When phosphorite was heated with moist sulphur dioxide in presence of air there was obtained a fine white powder consisting of calcium sulphate and pyrophosphate. The properties of this product are described and it is stated that it is as effective as a fertilizer as superphosphate or basic slag. It is not proposed, however, that it be used as a fertilizer in this form, but that it be converted into superphosphate by treatment with sulphuric acid. By this treatment a product is obtained which is of lower acidity than ordinary superphosphate.

The degree of fineness of fertilizer lime, D. MEYER (*Illus. Landw. Ztg.*, 33 (1913), No. 84, p. 755).—The author concludes from the examination of a large number of samples of agricultural lime that not less than 70 per cent of such lime should pass a sieve with meshes 0.2 mm. in diameter, and that not more than 75 per cent of the particles passing a 0.5 mm. sieve should be larger than 0.2 mm. in diameter. The particles larger than 0.5 mm. but smaller than 1 mm. should not exceed 25 to 50 per cent.

Evolution of sulphur in the soil: A study of its oxidation, C. BRIOUX and M. GUERBET (*Compt. Rend. Acad. Sci. [Paris]*, 156 (1913), No. 19, pp. 1476-1479; *Ann. Sci. Agron.*, 4. ser., 2 (1913), II, No. 4, pp. 385-396; *abs. in Rev. Sci. [Paris]*, 51 (1913), I, No. 21, p. 668; *Jour. Chem. Soc. [London]*, 104 (1913), No. 609, I, p. 811; *Chem. Zentbl.*, 1913, II, No. 4, p. 379).—The author studied the influence of the character of the soil and of certain carbohydrates on the oxidation of sulphur.

Sugar and starch appreciably retarded oxidation, while peptone and other nitrogenous substances favored it to such an extent that 82 per cent of the sulphur was oxidized in 30 days. The oxidation of the sulphur was due to

a very complicated bacteriological process probably involving a number of different kinds of bacteria. The addition of calcium carbonate greatly accelerated oxidation, but sterilization almost entirely prevented it.

The composition of sediments from the Potomac and Shenandoah rivers, J. G. SMITH and W. H. FRY (*Jour. Indus. and Engin. Chem.*, 5 1913), No. 12, pp. 1009-1011).—Mineralogical and chemical analyses of a large number of samples of the sediments are reported.

The mineralogical character of the sediments of the two rivers was decidedly different. The chemical analyses showed no definite relation between the composition and the amount of sediment carried by the streams when the samples were taken, and no uniformity of chemical composition of the sediments as a whole. It was found, however, that the fine particles were comparatively high in potash, phosphoric acid, lime, organic matter, etc.

The production and consumption of chemical fertilizers in the world (*Production et Consommation des Engrais Chimiques dans le Monde. Rome: Inst. Internat. Agr.*, 1913, pp. VI+134, pls. 6; rev. in *Jour. Soc. Chem. Indus.*, 32 (1913), No. 15, pp. 801, 802).—This report gives detailed statistics as far as they are available of the production of raw materials supplying phosphoric acid, potash, and nitrogen in fertilizers, and of the consumption of commercial fertilizers in 62 different countries, with a statement of the sources from which the information was drawn.

It is estimated that the value of the fertilizers at present consumed in the world exceeds \$400,000,000. The average consumption is stated to exceed 178 lbs. per acre of cultivated area in Belgium, Mauritius, and Luxemburg, and to vary from 89 to 178 lbs. in Germany and the Netherlands; from 45 to 89 lbs. in Denmark, United States (southern States), France, England, Australia, Italy, and Switzerland; from 9 to 45 lbs. in Austria, Hungary, Spain, United States (northeast), Norway, Dutch East Indies, Portugal, and Sweden. "All the remaining countries consume less than 9 lbs. per acre or an unknown amount." As a rule the latest figures given are those for 1911.

Commercial fertilizers and their importance in the world's industry, K. KUBIERSCHKY (*Ztschr. Angew. Chem.*, 26 (1913), No. 97, Aufsatzteil, pp. 721-729, fig. 1).—A historical and general review of this subject, based in part upon the report noted above.

AGRICULTURAL BOTANY.

Department of botanical research, D. T. MACDOUGAL (*Carnegie Inst. Washington Year Book*, 11 (1912), pp. 49-76, pl. 1).—An outline is given of the work carried on by the members attached to the laboratories maintained by this institution and of investigations carried on under its auspices. These include studies on phyto-chemistry, the water relations of plants, and the environic reactions of organisms. Among some of the lines of work more or less briefly reported upon are the alterations in woody tissues and bacterial action in Salton water, the behavior of micro-organisms in brines, the floral elements of the Salton region, physical and botanical features of Sudanese and Libyan deserts, botanical features of the Algerian Sahara (*E. S. R.*, 29, p. 626), depth of water table as a factor limiting distribution of trees, the soil moisture evaporation index and its relation to vegetation, water relations of plants, physical relations of roots to soil factors, structural relations in xenoparasitism (*E. S. R.*, 28, p. 332), the determination of leaf temperatures, and chemical effects of radiant energy in plant processes.

A bibliography is appended.

Origin of species by mutation, A. W. SUTTON (*IV. Conf. Internat. Génétique Paris, Compt. Rend. et Raps., 1911, pp. 158, 159; abs. in Bot. Centbl., 123 (1913), No. 10, p. 247*).—The author states that observations extending over 40 years have convinced him that, while permanent variations may appear and retain their distinctive characteristics when isolated and grown (some being, however, only fluctuating variations tending soon to lose their identity), there is nothing approaching a really new species which has arisen by so-called mutation in the plants observed.

On the principle of the coalescence of living plasmas and the origin of races and species, A. GAUTIER (*IV. Conf. Internat. Génétique Paris, Compt. Rend. et Raps., 1911, pp. 79–90, fig. 1; abs. in Bot. Centbl., 123 (1913), No. 9, pp. 214, 215*).—The author sums up the results of studies extending over some years.

Observations on cross-fertilization, grafting, etc., are claimed to show that somatic plasma possesses a property similar to that of the germ plasma, namely the power to transmit to the bud and to the ovary of the plant a modification which is immediately apparent and which in some cases may be transmitted to the offspring. The step from one race or species to another corresponds to a modification of the chemical principles essential to the race or species, this chemical differentiation being the sign of a corresponding variation in the protoplasm, resulting in a sudden alteration of function, of product, and of growth as regards external form. The coalescence of vegetable or somatic plasma may be as effective as that of germ plasma in the production of new races, uniting species and even genera. The stimulus may originate from insects, microbes, etc., acting directly or indirectly toward these results.

The author concludes that it is by the union or symbiosis of plasmas, sexual or somatic, resulting from fertilization, grafting, or parasitic or traumatic action, that, either modifying the relation of certain ferments or preventing their formation, gives rise to those abrupt changes by which new races or species are produced; and that the variations of the individuals and of the races thus formed do not transgress the limits beyond which analogy with anatomical structures or with specific chemical principles no longer exists.

Studies of natural and artificial parthenogenesis in the genus *Nicotiana*, R. WELLINGTON (*Amer. Nat., 47 (1913), No. 557, pp. 279–306; abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 4 (1913), No. 7, p. 1039*).—The author reports several hundred attempts with stimuli caused by foreign pollen, mutilations, fumigation, and infections on numerous species and varieties of *Nicotiana* to produce parthenogenesis in the seed without success, and concludes that it probably does not occur in the forms tested.

An extensive bibliography is given.

Periodicity of specific characters, P. VUILLEMIN (*Bul. Soc. Sci. Nancy, 3. ser., 13 (1913), No. 3, pp. 179–218, figs. 13*).—The author concludes an account of studies made by him on morphology in different stages, as noted in a number of plants, by stating that various forms of polymorphic plants or organs thereof may appear in a determinate order, which fact requires in such cases that these successive characters be employed to give a complete definition of the species. It is admitted that this habitual periodicity may be interfered with by external agencies, but it is still held that those teratological characters which exhibit periodic polymorphism are to be regarded as specific.

Biology and radio-activity, G. PETIT (*Rec. Méd. Vét., 90 (1913), No. 17, pp. 584–590, figs. 2*).—Besides brief mention of some work by other investigators, an account is given of recent studies by the author regarding the influence of radio-activity on rye grass, wheat, and corn. Some experiments on the last named showed a striking acceleration of growth, the results in general con-

firming previous conclusions reached by the author in connection with Ancelin (E. S. R., 29, p. 326).

The determination of the rays concerned in chlorophyll synthesis, P. A. DANGEARD (*Botaniste*, 12. ser., 1912, pp. XXI-XXVI; *abs. in Ann. Bot. [Rome]*, 11 (1913), No. 3, pp. 501, 502).—The author investigated further (E. S. R., 25, p. 221) the influence on chlorophyll synthesis of the different portions of the spectrum obtained from a Nernst lamp, employing in these later experiments a quartz prism.

It is stated that there exists a direct relation between the growth of a green alga and the absorption of radiations by its contained chlorophyll, the maximum effect appearing between the lines of wave length 660 to 670. The rate of absorption of chlorophyll in solutions by an alga or its rate of vegetative development therein corresponds closely to the concentration employed. Notwithstanding considerable absorption of xanthophyll below line 490, the energy absorbed is insufficient to cause chlorophyll synthesis in that part of the spectrum. It is also claimed that blue and violet rays do not appear to have any important influence on chlorophyll synthesis.

New observations on chlorophyll assimilation and reply to recent criticisms, P. A. DANGEARD (*Bul. Soc. Bot. France*, 60 (1913), No. 2-3, pp. 166-175).—Referring to results obtained from work above noted and calling attention to observations of other investigators, the author replies to certain objections offered to his previous conclusions.

Two years' experiments with static electricity as related to the growth of cultivated plants, P. TRNKA (*Zemědělskij Arch. (Arch. Bodenkult. Böhmen)*, 4 (1913), No. 1; *abs. in Bot. Centbl.*, 123 (1913), No. 6, p. 138).—The author gives an account of experiments in which insulated wire nets stretched at a height of 4 or 5 meters above 36 hectares of growing beets were subjected to an electric current of from 50,000 to 70,000 volts and 0.7 to 0.8 milliampères for 1,468 hours in 223 days of 1911, and 2,000 hours in 299 days of 1912.

The production of the field was sensibly increased, but the question as to the profitableness of the treatment was not fully settled. Differences in chemical composition were noted, both during the growing period and after maturity. These increased yields appear not to be explainable as due to differences in transpiration, stimulation, or assimilation processes, and this fact leads to the supposition that the electricity exerts its direct influence upon the soil rather than upon the plant. This mode of culture is thought to be better suited to plants having large assimilation surfaces.

On the growth of plants in partially sterilized soils, E. J. RUSSELL and F. R. PETHERBRIDGE (*Jour. Agr. Sci. [England]*, 5 (1913), No. 3, pp. 248-287, pls. 4, fig. 1).—For a number of years experiments have been in progress in growing plants in partially sterilized soils, and some of the observed facts are placed on record. The partial sterilization was effected by the use of toluene and by heating to 55 and 100° C.

The germination of seeds planted in these soils was sometimes hastened, at other times retarded. Retardation was almost always produced in soils heated to 100° or treated with toluene, while acceleration often followed the planting of seeds in soils heated to 55°. The retarding effect was generally more pronounced in moist than in dry soils and in rich than in poor ones.

In the seedling stages the plants produced on partially sterilized soils were sometimes indistinguishable from those on untreated soils. Seedling tomatoes grown on heated soils in comparison with those grown on untreated ones had smaller roots and smaller cotyledons of a darker green color, frequently showing some purple. The effect on the seedlings was most pronounced during the dull days of winter, and this has a practical application in the use of partial

sterilization for the growth of plants under glass. Later marked differences were shown, the purple color disappeared, and the plants began to show remarkable growth.

Sometimes soils treated with toluene behaved like those heated to 55°, but on rich soils early development was retarded. Other volatile antiseptics were found to behave like toluene.

Comparing partially sterilized with untreated soils, the authors found that there was generally a retardation in germination, although sometimes partial acceleration occurred. An acceleration in growth followed up to the time of the appearance of the third or fourth leaves, but sometimes a marked retardation was noticed, especially in rich soils heated to 100°. Where this retardation occurred it was accompanied by a very dark green leaf color and either the formation of a purple pigment or a tendency for the leaves to curl toward the underside. Later the purple color disappeared, the curling ceased, and rapid growth took place. The subsequent growth was finally proportional to the amount of food present. Plants grown on soils heated to 100° showed a remarkable development of fibrous roots, and, in comparison with those on untreated soils, had larger leaves of a deeper green color, stouter stems, usually shorter internodes, flowered earlier and more abundantly, and contained a higher percentage of nitrogen and sometimes of phosphoric acid in their dry matter. Plants grown on soils heated to 55° or treated with volatile antiseptics showed fewer of these effects.

Considering the chemical differences in the soils, it is stated that partially sterilized soils are characterized by an accumulation of ammonia, while untreated soils contain practically no ammonia. Soils heated to 100° are characterized by the presence of decomposition products, some of which possess characteristic colors and odors.

The authors present the data upon which their paper is based and give an extended discussion of their observations.

Some organic constituents of the culture solution and the mycelium of molds from soil, M. X. SULLIVAN (*Abs. in Science, n. ser.*, 38 (1913), No. 984, p. 678).—An examination was made of the dried mycelium of mixed mold cultures from soil, of *Penicillium glaucum* grown on Raulin's solution, and of the filtered solution after a mold growth to determine the various organic constituents.

In the mixed molds a large number of organic substances were found, many of which were subsequently recognized in *P. glaucum*. In the alcoholic soda extract of *P. glaucum* the author found oleic and palmitic acids, a fatty acid melting at 54° C., a fatty acid which appears to be elaidic acid, hypoxanthin, guanine and adenine, histidine, thymine, and chlorin. In the direct alcohol extract, mannite, cholesterol bodies, hypoxanthin, and cerebroside were found. Guanidine was determined from mold grown on Raulin's solution, to which peptone in small quantity was added. In the culture solution after a number of weeks' growth were found fatty acids, purine bases, a small quantity of a histidine-like body, pentose sugar, unidentified aldehydes, etc. Many of these compounds have been found in soil, and the conclusion is drawn that micro-organisms, such as yeast, bacteria, and molds, play an important part in their formation.

Polyatomic alcohols as sources of carbon for molds, R. E. NEIDIG (*Abs. in Science, n. ser.*, 38 (1913), No. 984, p. 675).—A comparison was made of methyl alcohol, glycol, glycerol, erythrite, adonite, mannite, dulcitol, and sorbitol to determine their availability as sources of carbon for 8 species of molds representing 4 genera.

It was found that methyl alcohol produced no growth, glycol induced germination only, glycerol produced strong cultures, erythrite could be used by the

majority of molds, and adonite by only a few. All 3 of the hexatomic alcohols may be considered good sources of carbon.

The influence of starch, peptone, and sugars on the toxicity of various nitrates to *Monilia sitophila*, O. KUNKEL (*Bul. Torrey Bot. Club*, 40 (1913), No. 11, pp. 625-639).—Studies were made to determine whether or not the toxicity of various salts to *M. sitophila* is influenced by sugars, starch, or peptones.

The results show beyond question that the concentration at which the various inorganic salts are toxic depends on the kind of organic substance contained in the media to which those salts are added. The degree of toxicity of the nitrates of barium, aluminum, iron, and urea depends on the organic substance contained in the media in which these salts are offered. Barium nitrate is more toxic in peptone than in starch media, while iron and aluminum nitrates are more toxic in starch than in peptone media. The toxicity of iron nitrate is approximately the same in starch as in other carbohydrates, but it is much less toxic in peptone media. Urea nitrate was found to be four times more toxic in starch than in peptone media.

On the effect of chloroform on the respiratory exchanges of leaves, D. THODAY (*Ann. Bot. [London]*, 27 (1913), No. 108, pp. 697-717, figs. 15).—The author made a study to determine whether a close quantitative relation exists between the evolution of carbon dioxide and the absorption of oxygen under the influence of stimulating agencies. Sunflower, garden nasturtium, cherry laurel, etc., were subjected to the effect of chloroform, and in all the leaves examined treatment with a small dose of chloroform resulted in a stimulation of the respiration, and the absorption of oxygen and production of carbon dioxide apparently remained coordinated. When the concentration of chloroform vapor was large enough to bring about visible disorganization, the production of carbon dioxide was diminished and the absorption of oxygen was no longer closely correlated with the production of carbon dioxide.

In leaves of the nasturtium (*Tropæolum majus*), which contain no tannin, the absorption of oxygen was depressed still more than the production of carbon dioxide. In leaves of other species containing tannin the absorption of oxygen was very rapid for a short time, and though falling quickly, remained at a higher level than the production of carbon dioxide.

Tannin and starch in the assimilating organs of Leguminosæ, H. KLENKE (*Ueber das Vorkommen von Gerbstoff und Stärke in den Assimilationsorganen der Leguminosen. Diss., Göttingen, 1912, pp. 83; abs. in Bot. Centbl.*, 122 (1913), No. 18, pp. 446, 447).—As a result of studies on 208 different species of Leguminosæ, the author concludes that tannin is usually more plentiful in leaves or parts more exposed to sunshine, especially in summer, reaching a maximum for the leaves in the vascular bundles and the leaf edges. The stomatal cells vary in this respect less than do neighboring cells. The concentration of tannin is said, however, to be greater in the petiole and shoot than in the leaf. Cells without tannin have more starch than do those containing tannin.

The castor bean plant and laboratory air, E. M. HARVEY (*Bot. Gaz.*, 56 (1913), No. 5, pp. 439-442).—The author reports having found potted seedlings of castor bean, grown under ordinary greenhouse conditions until they had developed from 5 to 7 leaves, were unusually susceptible to gas impurities. One part of ethylene to 50,000 of air was found to result in proliferation and exudation at leaf scars. Leaf fall took place in concentrations as low as 1 part of ethylene to 500,000 of air, or even to 1,000,000 parts of air. A drooping of the youngest well-developed leaves could be taken as an index of the occurrence of still lower concentrations of the gas.

Osmotic pressure in potatoes, M. A. BRANNON (*Bot. Gaz.*, 56 (1913), No. 5, pp. 433-438, figs. 4).—This article has been previously noted (*E. S. R.*, 29, p. 133).

Imbibition studies on seeds of *Avena sativa*, F. PLATE (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat.*, 5. ser., 22 (1913), II, No. 3, pp. 133-140).—Summing up studies carried out with beans in solutions of several acids, bases, and salts, the author claims that no exclusive part in imbibition is played by either cations or anions in this connection, and that most of these chemical agents promote germination even in high concentrations.

Influence of moisture relations on species of *Pinus*, B. HERGT (*Mitt. Thüring. Bot. Ver.*, 30 (1913), pp. 129, 130; abs. in *Bot. Centbl.*, 123 (1913), No. 9, p. 220).—The author notes a striking limitation in growth, during the dry year, 1911, of needles of *P. sylvestris* and *P. nigra* as compared with the 1912 growth on the same branches.

Defoliation: Its effects upon the growth and structure of the wood of *Larix*, A. G. HARPER (*Ann. Bot. [London]*, 27 (1913), No. 108, pp. 621-642, pls. 2, figs. 2).—A study has been made of trunks of larch trees that have been recently defoliated by the larvæ of the larch sawfly.

It was found that premature defoliation resulted in a greater or less degree of starvation, which was shown by the quantity of the growth and the structure of the wood formed. If starvation is severe, growth may cease over certain parts of the cambium mantle, while other regions are still active. The investigations showed that in larch trees killed by defoliation, growth ceased entirely at the base of the tree a year or more before the tree died. The first visible effects of defoliation in the structure of the wood is said to be the reduction of the proper thickening of the walls and cells of part or all of the zone of autumn wood, without much decrease in the breadth of the whole ring. The outermost cells of the autumn wood may have their walls unthickened on account of the lack of food supply at this period of the year. Abnormally formed resin ducts were found and they are considered possibly a pathological effect of starvation.

Root secretions of plants, E. A. MITSCHERLICH (*Landw. Vers. Stat.*, 81 (1913), No. 3-6, pp. 469-474).—This continues a somewhat controversial discussion by the author (*E. S. R.*, 28, p. 721), Rodewald (*E. S. R.*, 28, p. 722), and Pfeiffer et al. (*E. S. R.*, 28, p. 518), regarding the existence and expression of a law of minimum.

FIELD CROPS.

[Test work with forage and field crops], M. CALVINO (*Estac. Agr. Cent. [Mexico] Bol.* 66, 1912, pp. 3-23, 41-48, 67-72, pls. 22).—Trials in the production of forage crops are here reported.

Oats and white mustard grown together produced at the rate of 64,660 kg. of green fodder per hectare (28.77 tons per acre) in 3 months, and Thousand-headed kale yielded at the rate of 68,000 kg. in 5 months. *Dactylis glomerata*, *Phleum pratense*, and *Bromus inermis* made satisfactory growth, *Dactylis* being especially luxuriant and reaching 1½ meters at the flowering stage. Notes are given on variety tests of turnips and the value of turnips and oats sown together for forage. Tests of *Trigonella fœnum-græcum*, *Medicago arborea*, *Hedysarum coronarium*, and *Onobrychis sativa* are also mentioned.

Variety tests with potatoes produced yields ranging from 2,782 to 13,000 kg. per hectare. Whole tubers gave much better results as seed than cut tubers. Directions for seed selection of potatoes are given. Notes on the value, cultivation, harvest, and uses of buckwheat are given, as are also variety tests in which the yields ranged from 1,800 to 2,800 kg. per hectare.

[Crop experiments for 1912], E. LÓPEZ (*Bol. Ofic. Sec. Agr. Cuba*, 12 (1912), No. 6, pp. 673-681).—This report summarizes the experimental work done during the year with alfalfa, malanga (*Arum*), cassava, plantain, sugar cane, tobacco, peanuts, sweet potatoes, and maize.

[Crop experiments] (*Rev. Indus. y Agr. Tucumán*, 3 (1913), No. 10-11, pp. 477-487).—This paper reports results of variety and cultural tests of maize, rice, cowpeas, beggar weed, peanuts, and cotton.

Cooperative fertilizer and variety tests in Malmöhus County, 1912, L. FORSBERG (*Malmö, Låns Hushåll. Sällsk. Körtlsskr.*, 1912, No. 4, pp. 330-1007).—This report covers 83 cooperative fertilizer trials conducted at 59 different farms with barley and oats, mixed cereals, sugar beets, other root crops, potatoes, and meadows. Thirteen lime experiments were also conducted as well as variety tests with winter wheat, barley and oats, potatoes, and root crops.

The results of 4 years' work indicated that 37.5 per cent of the sandy soils experimented with were alkaline, 20 per cent neutral, and 42.5 per cent acid, while the corresponding figures for clay soils were 52.5, 21.5, and 26 per cent.

Report on hemp and tobacco in Italy and Holland, KLUFTINGER ET AL. (*Ber. Landw. Reichsanst. Innern*, 1913, No. 26, pp. VIII+153, pl. 1, figs. 4).—This publication contains accounts of the cultivation and manufacture of hemp in Italy and of tobacco in Italy, Java, and Sumatra.

Report of the work of the moorland experiment department of the agricultural chemical experiment station at Dublany in 1912, E. ANSON (*Ztschr. Moorkultur u. Torfverwert.*, 11 (1913), No. 2, pp. 50-68, figs. 4).—In testing the value of moorland for the production of hay, over 20 varieties of cultivated grasses were sown singly and in various mixtures without fertilizers. The yields of the pure cultures ranged from 34.68 to 84 quintals per hectare and the mixtures from 32.5 to 68.85 quintals (from 1.4 to 3 tons per acre).

Potatoes yielded as high as 294.5 quintals per hectare with 400 kg. of 40 per cent potash salt and 100 loads of barnyard manure. The use of 400 kg. each of 40 per cent potash salts and Thomas slag per hectare produced 355.66 quintals of potatoes, as against 242.3 quintals with an application of 200 kg. of flowers of sulphur.

Trials of sugar beets, summer and winter rye, hemp, vetch, seradella, lupines, summer and winter wheat, barley, flax, sunflowers, and oats are also reported.

Annual report of the Bankipur Agricultural Experimental Station, 1911-12, G. SHERRARD (*Ann. Rpt. Bankipur Agr. Expt. Sta. [India]*, 1911-12, pp. 12).—This report gives tabulated results of manurial experiments, with cost data, variety tests, and seeding and plowing experiments with rice and sugar cane. The profits were greatest when cow manure and castor cake were used.

Notes on forage in Java and India, C. V. PIPER (*Philippine Agr. Rev. [English Ed.]*, 5 (1912), No. 8, pp. 428-431, pl. 1).—This paper contains brief notes on *Paspalum conjugatum*, *Panicum numidianum*, *Polytrias præmorsa*, *Imperata exaltata*, *Paspalum marginatum*, *Andropogon annulatus*, *Pennisetum cenchroides*, and *Eleusine coracana* as native forage plants in these countries.

Magney (Cantala) and sisal in the Philippines, M. M. SALEEBY (*Philippine Agr. Rev. [English Ed.]*, 6 (1913), No. 4, pp. 183-188, pls. 4).—This article discusses the history, introduction, methods of cultivation, and preparation of the fiber of these two plants in the Philippines.

Tests of raw phosphates, P. E. GALZEW and I. W. JAKUSCHKIN (*Izv. Moskov. Selsk. Khoz. Inst. [Ann. Inst. Agron. Moscow]*, 19 (1913), No. 1, pp. 193-204, figs. 2).—These phosphates were derived from different geological formations, viz, golt, turon, and Rjasen, and showed varying values when applied to yellow lupines and buckwheat.

On variation in rust resistance of different forms of pure lines of spring wheat, spring barley, and oats, N. LITWINOW (*Trudy Būro Prikl. Bot. (Bul. Angew. Bot.)*, 5 (1912), No. 10, pp. 347-423).—This article gives data in tabular form, obtained from observations during 1910 and 1911, of 186 forms of pure lines of spring wheat, 49 forms of barley, and 50 forms of oats in regard to their behavior toward various rust forms (*Puccinia graminis*, *P. simplex*, *P. coronifera*, and *P. triticea*), including descriptions of leaf surface and dates of sending up shoots of each variety.

The laying down of permanent pastures and meadows, H. LANG (*Landw. Hefte*, 1913, No. 12, pp. 32).—This article describes the most important grasses, clovers, and other plants used in pastures and meadows, and gives directions for the selection of soils, varieties, and mixtures for certain purposes. Methods of preparing the seed bed, seeding, cover crops to use, and the care of new meadows and pastures are also discussed.

The care of permanent meadows and pastures, H. LANG (*Landw. Hefte*, 1913, No. 13, pp. 32).—This article discusses the artificial and natural methods of regulating the stand of grasses, combating pests, fertilization, irrigation, drainage, and the rejuvenating of permanent meadows and pastures.

The production of grass and hay, C. M. CONNER (*Philippine Agr. Rev. [English Ed.]*, 6 (1913), No. 2, pp. 81-85, pl. 1).—This paper gives descriptions of the production and uses of the native grasses, barit (*Leersia hexandra*), luyaluya (*Panicum repens*), and manimanian (*Alsicarpus*).

Propagating abacá (Manila hemp) from seed, M. M. SALEEBY (*Philippine Agr. Rev. [English Ed.]*, 6 (1913), No. 2, pp. 99-101).—Successful trials in propagating *Baguisanon lawaan* and the Pulajan and Tangongon varieties from seed are noted.

The renovation of the abacá (Manila hemp) industry, M. M. SALEEBY (*Philippine Agr. Rev. [English Ed.]*, 6 (1913), No. 4, pp. 167-182, pls. 5).—This article discusses suitable cultural methods, planting, renewal of old plantations, improvement of the quality of the fiber, and adjustment of relations between buyers and producers, with regard to Manila hemp in the Philippine Islands.

Experiments with alfalfa in 1910 at Turkestan Agricultural Experiment Station, P. SHREDER (*Turkest. Selsk. Khoz.*, 1911, No. 5; *abs. in Zhur. Opytn. Agron. (Russ. Jour. Expt. Landw.)*, 13 (1912), No. 3, pp. 444, 445).—In studying the influence of slope of the field on the yield of alfalfa it was found that results on a 4 to 5° slope were slightly better than on a 2 to 3° slope. Better yields were produced with barnyard manure than with superphosphate 4 years after application, and in comparing bone meal and ashes the latter was found to have made better yields on a 7-year-old field. In an experiment comparing superphosphate, Thomas slag, bone meal, and barnyard manure, superphosphate gave the best results the second year after application. It was found that alfalfa seed from England, France, Russia, and Germany produced better than native seed.

Barley, H. QUANTE (*Die Gerste. Berlin*, 1913, pp. 195, figs. 35).—This book treats of the morphological, anatomical, and chemical characteristics of barley, its history, development, botanical relations, and varieties; describes brewing valuations, according to the Vienna, Berlin, and Haase systems; and discusses methods of cultivation, harvest, storage, and artificial drying of the grain.

Svalöf golden barley, H. TEDIN (*Sveriges Utsädesför. Tidskr.*, 23 (1913), No. 1, pp. 27-50, pl. 1).—This article discusses the origin of this new variety of barley, the chief characteristics of which are its heavy yield of grain, resistance to smut (*Ustilago carbo*), and quick curing of the grain after harvest.

Cultural experiments at Stettin, K. STÖRMER (*Deut. Landw. Presse*, 40 (1913), Nos. 5, pp. 47, 48; 6, pp. 58, 59).—These articles report the results of

growing several varieties of barley on clay and sandy soils. The yields ranged from 811 to 2,150 lbs. of grain per morgen (1,285 to 3,410 lbs. per acre); 1,000 kernels weighed from 34.88 to 48.05 gm., and a hectoliter weighed from 63.9 to 69.65 kg.

New directions in the work of the selection of maize, I. ROSEN (*Khozâistvo*, 1912, No. 31, pp. 1013-1020; abs. in *Internat. Inst. Agr.* [Rome], *Bul. Bur. Agr. Intel. and Plant Diseases*, 3 (1912), No. 10, pp. 2156-2159).—This article discusses a system of producing and using the first hybrid generation to secure increased yields with maize, the objects of this system being to prevent self-fertilization and to keep the 2 parent strains pure. It is stated that the 2 strains may be kept pure by planting in alternate rows. The rows of 1 strain are topped the same year and from these the hybrid seed is obtained, while the plants of the other row supply the caryopses (for 2 years) required for the preservation and propagation of that strain; in the subsequent year the opposite plan is followed.

The following observations are noted: "The descendants of a self-fertilized plant are always less developed and productive than the descendants of plants naturally exposed in the fields to cross-fertilization; this is true both of superior individuals and individuals inferior in point of productivity to the average of the type to which they belong. The greatest diminution in the growth and yield in consequence of self-fertilization is found in the first generation, falling off gradually in the subsequent generations down to a constant value. The pure strains (or self-fertilized, coming from a single parent plant) are distinguished, among themselves, by transmissible morphological characters. The retrogression of the fluctuating characters is observed with greater frequency in proportion as we get farther away from the 'mean morphological type' characteristic of a 'pure strain.' The crossing between 'brothers' and 'sisters' (between male and female inflorescences, respectively, of 2 plants coming from a single parent plant and belonging to the same generation) presents no advantage over self-fertilization. Crossing between 2 self-fertilized strains of different types yields a progeny which is not inferior in force of growth and productivity to the plants never subjected to self-fertilization.

"In crossing 2 self-fertilized strains the results from the reciprocal crosses are identical. The seeds of F_1 obtained by crossing pure strains according to a determined scheme (combination) always exceed in yield the sowing material produced by irregular pollination in the fields, from which the 2 strains themselves were derived. The productivity and morphological characteristics of the hybrids of the first generation are therefore a function of that specified combination of pure strains, and are constantly repeated when the crossing is renewed. In the first generation of hybrids (F_1) the degree of variability of the individuals is not greater than that observed in the pure strains from which such generation sprang. In the second generation of hybrids (F_2) the degree of variability is higher than in F_1 . The productivity of F_2 is lower than that of F_1 ."

Variety tests of imported maize, A. H. ROSENFELD (*Rev. Indus. y Agr. Tucumán*, 3 (1912), No. 2, pp. 51-53).—Results are given of tests conducted with 16 varieties of maize. In general the yields were much better in 1912, ranging from 387 to 3,535 kg. than in 1911, when they ranged from 234 to 2,675 kg. of grain per hectare.

A new variety of maize, C. M. CONNER (*Philippine Agr. Rev.* [English Ed.], 6 (1913), No. 2, p. 96).—This new variety is a cross between the Mexican June and a native white variety, and is named Moro. Preliminary tests have shown it to yield better than the small native varieties and to make good meal and

hominy. The ears average 19 cm. (7.4 in.) long and 5 cm. thick at the center and have 16 rows of grain.

Distance to plant maize, A. H. ROSENFELD (*Rev. Indus. y Agr. Tucumán*, 3 (1912), No. 6, pp. 231-235).—In this experiment plants spaced 125 cm. (about 49 in.) in rows 30 and 75 cm. apart gave better results than plants spaced 40, 75, or 100 cm. in rows spaced 30, 75, and 100 cm. apart. The check-row system, with hills of 3 or 4 plants about 1 meter apart, yielded about 30 per cent better than the row system.

Fertilizing maize (*Prog. Agr. y Pecuario*, 19 (1913), No. 818, pp. 258-260).—Results of the use of commercial fertilizers for corn in 3 different fields are given, in which increased yields were obtained at a profit by the use of the fertilizer.

The effect of water level on the yield of cotton (*Agr. Jour. Egypt*, 2 (1912), No. 1, pp. 37, 38, fig. 1).—The results of an experiment, in which the water level ranged from 0.8 to 2.2 meters (from 31 to 86 in.) below the ground surface, showed increased yields as the depth of water level increased.

A report on the production of new cottons, W. L. BALLS (*Agr. Jour. Egypt*, 2 (1912), No. 2, pp. 66-77, pls. 4).—This article gives the methods employed in crossing and the preventing of crossing, and discusses the time required for propagation, simple propagation of seed, a list of approximate constants, and possible rates of propagation. In some of the new cottons produced the mean maximum lint strength ranged from 27.7 to 33.5 mm.

Experiments in cotton cultivation at the experiment station of Karaiasi, Transcaucasia, V. DMITRIEVSKI (*Abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases*, 3 (1912), No. 11, pp. 2425, 2426).—This experiment was based upon the color of the cotton seeds, and as a rule the green seeds gave a more abundant and finer fiber than those of other colors. The results of planting seeds picked at different dates showed very little difference in yield or date of maturity, although the slight difference was in favor of the later picking.

Annual report of the government cotton station at Myombo (*Pflanzer*, 8 (1912), No. 6, pp. 323-334).—In a test of 6 varieties the yields of ginned cotton ranged from 52.6 to 213.2 kg. per hectare (46.8 to 189.7 lbs. per acre). Seed planted January 22 produced 196.4 kg.; that on February 3, 92.4 kg.; that on February 20, 34.8 kg.; and that on March 4, 10 kg. ginned cotton per hectare. When plants were thinned to 2 in a hill placed 100 by 80 cm. apart, the yields of ginned cotton were, on 2 plats, 129.2 and 138.4 kg. per hectare, respectively, and when thinned to only 1 plant per hill on 2 plats 53.5 and 42 kg. per hectare, respectively. Irrigation did not increase the yields.

Cowpeas, R. E. BLOUIN (*Rev. Indus. y Agr. Tucumán*, 3 (1913), No. 8, pp. 355-359).—Numerous varieties are described and methods of production, alone and in combination with maize and with cane, are discussed.

Don experiment field, I. KOLESNIKOV (*Abs. in Zhur. Opytn. Agron. (Russ. Jour. Expt. Landw.)*, 13 (1912), No. 3, pp. 448, 449).—The apparent increase in the yield of flaxseed for 9 years due to deeper plowing amounted to 14 per cent.

Fertilizers in the production of hemp, PALLADIUS (*Prog. Agr. y Pecuario*, 18 (1912), No. 770, pp. 261-264, figs. 4).—In these experiments it was found that the addition of potash to other fertilizers apparently increased the yield of fiber, in some cases more than 100 per cent. The yields ranged from 1,850 to 2,530 kg. per hectare (1,646 to 2,251 lbs. per acre).

Studies on hemp culture in Italy, W. F. BRUCK (*Tropenpflanzer*, 15 (1911), Nos. 3, pp. 129-141; 4, pp. 187-202; 5, pp. 244-264, figs. 6).—This article discusses the importance of the hemp industry in Italy, gives a brief historical review, including the development of hemp culture in different parts of the

country, and describes at greater length the Italian culture of the crop. The relation of hemp culture to farm management, farm labor, and export trade is also dwelt upon, and types of machines used in the different processes of preparing the fiber for market and for use are described.

New cover crop, F. G. SPRING (*Agr. Bul. Fed. Malay States*, 1 (1912), No. 1, pp. 13, 14).—This describes the horse gram (*Dolichos biflorus*), gives directions for its cultivation, and discusses its value as a cover crop for rubber plantations. Its chief value for this purpose lay in choking out weeds.

The Italian millet (*Setaria italica*) in Bengal, E. J. WOODHOUSE and A. C. GHOSH (*Dept. Agr. Bengal, Quart. Jour.*, 5 (1912), No. 4, pp. 180-186).—Detailed descriptions of several varieties of this millet are given, also the results of head selection during one season's work. It is noted that this crop seems well suited to Bengal conditions, producing yields when maize fails.

Philippine kapok: A promising new industry, M. M. SALEEBY (*Philippine Agr. Rev. [English Ed.]*, 5 (1912), No. 8, pp. 432-437).—This paper gives brief notes on the export trade of kapok in Java, the Philippines, and Dutch East India, and on the yield, value, and uses of the crop and its prospective cultivation in the Philippines.

Potato breeding, C. FRUWIRTH (*Deut. Landw. Presse*, 39 (1912), Nos. 47, pp. 551, 552; 48, pp. 565-567, figs. 4).—The author here relates his experience in hybridizing potatoes. Hand fertilization of the flowers proved unsuccessful. From a study of the plants produced from seed which was obtained from the balls produced by accidental crossing, or self-fertilization, it is noted that the offspring seldom, if ever, resembled the mother plant; that the long form was dominant over round; and that the red skin color of the tuber, the lilac color of the flower, and the yellow color of the tuber flesh were respectively dominant over white.

Notes on the propagation of Rhodes grass for hay, H. F. HUNGERFORD (*Philippine Agr. Rev. [English Ed.]*, 5 (1912), No. 8, pp. 438-443, fig. 1).—This paper suggests methods of propagation, irrigation, harvesting, and baling of Rhodes grass (*Chloris gayana*) for trial in the Philippines in the production of this grass for hay.

Selection of seed rice based on transparency, C. CREVOST (*Bul. Écon. Indochine, n. ser.*, 15 (1912), No. 96, pp. 388-392, figs. 2).—This article describes the method employed in seed selection of rice by passing before the rays of a lamp. Numerous varieties were thus selected and a maximum of 47 per cent, a minimum of 11.4 per cent, and an average of 22.3 per cent of inferior kernels were detected. Certain samples weighed 570 gm. per liter before selection and 620 gm. afterwards.

A description of the apparatus employed in this selection is given.

Data concerning varieties of rice, C. M. CONNER (*Philippine Agr. Rev. [English Ed.]*, 6 (1913), No. 2, pp. 86-92, figs. 4).—This paper records a continuation of work already mentioned (E. S. R., 28, p. 535), in which 279 varieties of white lowland rice grown in Indo-China were compared with a like number of lowland varieties grown in the Philippine Islands.

The greatest number of varieties matured within 6 months from sowing and the time to maturity had no relation to yield. It was found that the number of grains per head was in inverse ratio to the size of the grain, and that the size of the grain had little influence on yield. A distinguishing characteristic of the upland rice was that its average length and width of leaf was 41 and 20 per cent, respectively, greater than that of the lowland varieties.

Salt water rice, C. M. CONNER (*Philippine Agr. Rev. [English Ed.]*, 6 (1913), No. 2, p. 97).—Tests showed that a variety of rice found growing in sea water produced as well when irrigated with this water as it did with fresh water.

Samar (*Cyperus alopecuroides*) as a reclamation crop, J. D. SHEPHERD (*Agr. Jour. Egypt*, 2 (1912), No. 2, pp. 78-80, pl. 1).—A method of growing this crop (which is used to make mats, etc.) on land too wet for rice is described.

Magnesia fertilizer for sugar beets, F. STROHMER and O. FALLADA (*Österr. Ungar. Ztschr. Zuckerindus. u. Landw.*, 42 (1913), No. 2, pp. 221-231).—The results of fertilizing 3 plats with magnesium sulphate showed no variation in total yield, sugar content, or chlorophyll content of the beet leaves, over 3 untreated plats that could be attributed to the magnesium salt, which was applied at the rate of 150 kg. per hectare (133.5 lbs. per acre). A bibliography is appended.

Conditions of seed ball produced by stock beets of different sizes, T. REMY (*Zent. Ver. Rübenz. Indus. [Vienna]*, 51 (1913), No. 7, pp. 116, 117).—This article gives the results of experiments in producing seed from whole beets and divided beets (cuttings). It is noted that cuttings of from 100 to 150 gm. in weight, standing 70 by 80 cm. apart, produced as much seed as 10 times the same weight of whole beets standing 1 meter each way. The seeds from the cuttings seemed to have the same productive power as those from the whole beets.

The influence of light on sugar formation of beets, F. STROHMER (*Österr. Ungar. Ztschr. Zuckerindus. u. Landw.*, 42 (1913), No. 2, pp. 232-235; *Wchnschr. Zent. Ver. Rübenz. Indus. [Vienna]*, 51 (1913), No. 7, pp. 116, 117).—This article discusses further work (E. S. R., 28, p. 825) on the influence of light and shade on sugar-beet development in general, and gives results of the author's investigations. In these the percentage of sugar did not seem to change, but the total yield was considerably greater in direct sunlight than in shadow, ranging from 80.1 to 72.1 gm. per beet in the former and from 34.1 to 25.6 gm. in the latter case with 2 varieties.

Variety tests of sugar cane, A. H. ROSENFELD and J. A. HALL (*Rev. Indus. y Agr. Tucumán*, 3 (1913), No. 8, pp. 325-334).—This article gives the results of tests of over 70 varieties of cane in 1910-1912, in which the yields ranged from 88 to 6,774 kg. of sugar per hectare (78 to 6,029 lbs. per acre).

Tests in selection of sugar cane before planting, A. H. ROSENFELD (*Rev. Indus. y Agr. Tucumán*, 3 (1912), No. 1, pp. 1-5).—The methods of selection and cultivation are described. Germination in the field showed a ratio of the selected cane to the unselected of 153:44. The selected seed yielded 62,964 kg. of cane, which produced 3,425 kg. sugar per hectare, as compared with 51,216 kg. cane yielding 1,975 kg. of sugar per hectare. It is also noted that only about 37 per cent of the crop from the selected seed was injured by worms, as compared with 60 per cent of the unselected crop.

Sugar-cane experiments in Antigua and St. Kitts, 1910-11, H. A. TEMPANY (*Jour. Bd. Agr. Brit. Guiana*, 6 (1912), No. 2, pp. 58-60).—Results of variety and manurial tests are given. Nitrate of soda and sulphate of ammonia at the rate of 40 and 60 lbs. per acre in a single application apparently increased the yields, while phosphoric acid and potash gave no increase.

The crops on the experimental sugar-cane fields, 1911, J. B. HARRISON and F. B. STOCKDALE (*Jour. Bd. Agr. Brit. Guiana*, 5 (1912), No. 4, pp. 212-230).—In variety tests the yields ranged from 1.48 to 3.37 tons sugar per acre. In fertilizer tests better results followed the application of about 300 lbs. per acre of sulphate of ammonia than that of other fertilizers.

Experiments in the cultivation of sugar cane in 1912 and 1913, R. E. BLOUIN (*Rev. Indus. y Agr. Tucumán*, 3 (1913), No. 10-11, pp. 418-477).—This article gives notes and data on varieties tested, methods of cultivation, the use of fertilizer plus lime, selection, rotations, and distance in planting.

A new earth nut, O. W. BARRETT (*Philippine Agr. Rev. [English Ed.]*, 6 (1913), No. 2, pp. 104, 105).—It is noted that this new nut has been discovered in West Africa and is known as *Voandzeia poissoni*, or *Kerstingiella geocarpa*.

Xenia in wheat, L. BLARINGHEM (*Compt. Rend. Acad. Sci. [Paris]*, 156 (1913), No. 10, pp. 802-804, fig. 1).—The author describes a hybrid that he produced and which, it is claimed, showed the influence of the pollen in the size and shape of the caryopsis and in the morphological characters of the albumin. Tabulated measurements of kernels are given.

Notes on wheat, J. CASCÓN (*Bol. Agr. Téc. y Econ.*, 2 (1910), No. 22, pp. 373-382; 3 (1911), Nos. 25, pp. 86-91; 35, pp. 1041-1048; 4 (1912), No. 47, pp. 1035-1047, pls. 3).—These reports give the results of variety tests and other data on the measurements of wheat, barley, and oats grown in 1910-1912 in Spain. Improvements in yields and conditions in general are noted from year to year, especially with foreign introductions.

In 8 varieties of wheat grown in 1912 the average length of heads ranged from 9.4 to 16.3 cm. The weight of 10 heads ranged from 15.6 to 28.5 gm.; the average weight of individual heads from 1.56 to 2.85 gm.; the weight of grain from 10 heads of each variety, from 11.7 to 20.6 gm.; the number of kernels per head, from 29.5 to 49.4 gm., and the weight of 1,000 kernels, from 36.3 to 53.95 gm. The volume of 1,000 kernels ranged from 28.8 to 41.5 cc.; the volume of 1 liter, 525.4 to 681.7 cc.; the specific gravity from 1.25 to 1.62, and the number of kernels per liter from 16,137 to 22,746. The number of kernels per kilogram ranged from 18,533 to 27,548, and the weight of 1 liter of kernels from 824.6 to 880.2 gm. The yields of wheat per hectare ranged from 2,366 to 3,351 kg., and barley from 3,987 to 4,100 kg. Oats yielded 2,115 kg.

Results of fertilizer experiments with wheat, barley, and oats, and the analyses of wheat flours for 1912 are given in tabular form.

Observations on stooling in cereals at the Poltava Experiment Station, P. LESHCHENKO (*Khutorianin*, 1911, No. 40; *abs. in Zhur. Opytn. Agron. (Russ. Jour. Expt. Landw.)*, 13 (1912), No. 3, pp. 478, 479).—Eight plants of winter wheat and 10 of spring wheat were selected and placed under observation, the time of appearance of the heads of each stem being noted in order to determine the relation to yield.

From the collected data it appears that the later the heads formed and developed the less was the yield. Determinations were made of the length and weight of each head and of the weight and number of kernels of each head. The author further observed that plants in cases of intense stooling lost enormous quantities of energy in producing barren stalks. None of the plants with an average of 20 stalks had more than 12 stalks which produced heads.

Determination of the germinative ability and germinative strength of seeds, W. OETKEN (*Deut. Landw. Presse*, 40 (1913), Nos. 24, pp. 287, 288; 25, p. 305; 27, pp. 329, 330; 28, p. 337, figs. 2).—The author first sets forth the difficulty of getting results with germination tests in the laboratory which correspond to field results with exactness, because of the "artificial" seed beds and other "artificial" conditions commonly used in the laboratory. It is noted that, to secure the desired results with seed germination, tests must be conducted with the 4 following points in view: To secure natural temperature conditions in order to promote rapid germination; to secure uniform resistance to vegetative energy; to cover a definite period of growth so as to determine the rate of development of the seedlings by weight of dry matter produced; and to determine the degree of health of the seedling as soon as it appears.

In a test with peas to determine the efficiency of sand and soil as germinating mediums, the percentage of germination in the sand ranged from 85 to 100 per cent, in the soil from 24 to 86 per cent, and in the field from 15 to 68 per cent. In testing the advisability of taking the weights of the seedlings at the end of a definite period, in order to determine the relative vegetative energy, it was found that samples of winter wheat showing 90, 71.25, 21, 36, 60, 48.25, and 46 per cent weighed, respectively, at the end of 10 days, 5.30, 3.79, 28, 1.65, 69, 2.27, and 57 gm. With spring wheat the variation between germinative ability and weight of seedling was even greater.

Report of the superintendent of the seed and weed branch, A. McKENNEY (*Ann. Rpt. Dept. Agr. Alberta, 1911, pp. 133-140*).—The methods described as being the most successful in the eradication of stinkweed are summer fallow and spring harrowing. For wild mustard, spraying with a 20 per cent solution of iron sulphate or a 2 per cent solution of copper sulphate is recommended, and for Canada thistle, continued cutting off at or below the surface of the ground.

Tabulated data of results of inspection of cars of seed supplied the farmers by the Dominion government are included.

Agrostemma githago and *Polygonum convolvulus*, N. SKALOSUBOW (*Trudy Būro Prikl. Bot. (Bul. Angew. Bot.), 4 (1911), No. 11, pp. 562-565*).—This article discusses the prevalence of these weeds in western Siberia and the value of the seeds and meal as feed for live stock.

HORTICULTURE.

The propagation and pruning of hardy trees, shrubs, miscellaneous plants, with chapters on manuring and planting, J. C. NEWSHAM (*London, 1913, pp. XIV+224, pls. 57*).—A practical treatise on plant propagation and pruning, in which consideration is given to fruit trees, ornamental deciduous trees and shrubs, and evergreen trees and shrubs, as well as to stove and greenhouse foliage and flowering trees and shrubs.

Practical tree repair, E. PEETS (*New York, 1913, pp. IV+265, pls. 16, figs. 62*).—A practical treatise on the physical repair of trees, such as bracing and the treatment of wounds and cavities. Chapters on boring insects and their control and rot fungi and their work are included.

The use of arsenicals for plant protection, with special reference to lead arsenate, L. FULMEK (*Arch. Chem. u. Mikros., 6 (1913), No. 6, pp. 347-408*).—A review of our knowledge relative to the use of arsenicals in various countries for the protection of plants. An extensive bibliography is appended.

The effect of bastard trenching on the soil and on plant growth, S. U. PICKERING and E. J. RUSSELL (*Jour. Agr. Sci. [England], 5 (1913), No. 4, pp. 483-496*).—The purpose of the experiments here reported was to determine the value of subsoiling without the addition of farmyard manure or other fertilizing material. The bulk of the experiments extended over the four seasons from March, 1909, to the end of 1912. Four distinct types of soil, including a light sand, two rather heavy loams, and a strong clay, were investigated. Trenching was effected by removing the first and second spades of soil. The third spade was broken up but not removed, and then the second and first spades were replaced in their natural order. Nothing was buried in the trench. Samples of soil were periodically taken for determinations of moisture and nitrates and observations were made on the growth of fruit trees on the plats.

Taking the evidence as a whole the effect of bastard trenching on the soil when unaccompanied by manuring is very small. Beyond a tendency to facilitate the drainage of water in the clays and the heavy loams and slightly to increase the nitrates no definite change seemed to be produced. As exemplified

by these experiments and by results obtained in some earlier experiments on the same plat of ground the effect on the growth of trees appears to depend largely on the character of the seasons following the trenching and planting. Generally speaking the author concludes that in the absence of a hardpan the main use of trenching seems to be that it affords an opportunity for adding manure or other fertilizer material to the soil.

An economic study of beans, E. M. LEDYARD (*Philippine Agr. and Forester*, 2 (1912), No. 4-6, pp. 66-85).—An economic and cultural test of a number of different species of beans is reported. The author concludes that on account of its wide adaptation as regards soil and its value as a garden and field bean, and also as a soil improver the cowpea is well adapted for general introduction into the Philippine Islands. The cowpea resembles the Philippine sitao which is a favorite bean for culinary use in the islands.

Supplementary studies on the differential mortality with respect to seed weight in the germination of garden beans, J. A. HARRIS (*Amer. Nat.*, 47 (1913), Nos. 563, pp. 683-700; 564, pp. 739-759, figs. 5).—In an earlier study of field cultures of *Phaseolus vulgaris* the author found that both large and small seed are less capable of developing into fertile plants than are those which do not deviate so widely either above or below the type (E. S. R., 28, p. 636). In order to substantiate these results greenhouse plantings in sand of some 46,000 individually weighed seeds, chiefly of the pedigrees employed in the field experiments, were made. The present paper discusses the results of this second study with special reference to the questions of the existence of a differential mortality and of its consequences in the population.

In general the results of the first study are fully confirmed. As a result of the more extended data secured from these greenhouse cultures, the author is led to conclude that there is strong evidence for varietal differences with respect to mortality. In some strains the heavier, in others the lighter, seeds seem less capable of development. From the data at hand no definite conclusion is drawn relative to the cause of this variation, but it is suggested that the reason for these differences may be sought in the inherent characters of the stocks used or the environment to which they have been subjected.

The author's studies are to be continued for the purpose of determining the causes of the observed differences in viability.

The pollination of fruit trees and its bearing on planting, C. H. HOOPER (*Gard. Chron.*, 3. ser., 54 (1913), Nos. 1406, pp. 393, 394; 1407, p. 420).—A review of recent European investigations on this subject, all of which tend to show that cross-pollination is the rule and that this is effected more by insects than by the wind. Honeybees and bumblebees are the best pollenizers. See also a previous note (E. S. R., 28, p. 237).

On the pruning and spacing of grapevines, J. L. VIDAL (*Rev. Vit.*, 39 (1913), Nos. 1013, pp. 689-693; 1014, pp. 713-720; 1015, pp. 752-756; 1017, pp. 814-819; *Bul. Agr. Algérie et Tunisie*, 19 (1913), Nos. 15, pp. 305-319; 16 pp. 321-331).—The author here reports a comparative test of various systems of pruning and spacing grapes as conducted with vines grafted to 24 different stocks. Information is also given relative to the value of these stocks for a limey soil.

On the behavior of various grape stocks on heavy calcareous soil, H. FAES (*Prog. Agr. et Vit. (Ed. l'Est-Centre)*, 34 (1913), No. 50, pp. 743-746).—Summarized data are given showing the annual condition of Chasselas grapes grafted on various American and French-American grape stocks and set out on a heavy limey soil in 1909. Generally speaking the French-American stocks have been somewhat superior to the pure American stocks in their resistance to adverse soil conditions.

The hybrid direct bearers in the valley of the Rhone in 1912, A. DESMOLINS and V. VILLARD (*Prog. Agr. et Vit. (Ed. l'Est-Centre)*, 34 (1913), No. 40, pp. 433-436).—In continuation of previous observations relative to hybrid direct bearing grapes (E. S. R., 27, p. 540) the results for the first season are given of observations which deal with the time at which the different varieties start growth in the spring. These observations are to be continued for a number of years.

Date growing in the Old World and the New, P. B. POPENOE (*Altadena, Cal.*, 1913, pp. XVIII+316, pls. 40).—In part 1 of this work the author gives a detailed account of commercial date growing in the Old World and in the United States, including methods of propagation, cultural operations, handling the crop, artificial ripening, diseases and pests, the classification of dates, profit of date growing, and uses of the date, with a chapter on its food value by C. L. Bennett. Part 2 contains a descriptive list of the important varieties which are now being grown in the United States.

Tea, EDITH A. BROWNE (*London*, 1912, pp. VIII+88, pls. 23).—A descriptive account of the tea industry in various countries.

Fertilizers and the freezing of nut trees (*Rev. Sci. [Paris]*, 51 (1913), II, No. 26, p. 813).—Brief reference is made to experiments in which the winter application of mineral fertilizers not only increased the vigor and yield of almond trees but apparently increased their resistance to cold to a marked extent.

Indoor gardening in room and greenhouse, H. H. THOMAS (*London, New York, Toronto, and Melbourne*, 1912, pp. 152, figs. 149).—A popular treatise on the culture of house and greenhouse ornamentals with a working calendar for the year. A chapter on the forcing of grapes is also included.

The hardy flower book, E. H. JENKINS, edited by F. W. HARVEY (*London and New York*, 1913, pp. XIV+143, pl. 1, figs. 50).—This work is offered as a complete guide to the methods of planting and cultivating hardy flowers. Part 1 deals with the principal uses of hardy flowers and discusses in detail some of the more important families as well as the proper grouping of plants for borders. Part 2 consists of an alphabetical list of all hardy herbaceous flowers considered worth growing, together with concise directions for their treatment. Part 3 consists of tabulated lists of hardy plants for all purposes.

The florist's bibliography: Supplement and index, C. H. PAYNE (*London*, 1912, pp. 79-100+VIII).—This publication, which supplements a handbook issued in 1908 (E. S. R., 21, p. 46) contains a list of recent references to books and treatises devoted primarily to florist's flowers and the flower garden.

FORESTRY.

Annual report on the progress, literature, and important happenings in the realms of forestry, hunting, and fishing for the year 1912, H. WEBER (*Allg. Forst u. Jagd Ztg.*, 1913, Sup., pp. VIII+199).—As in previous years (E. S. R., 27, p. 845), this supplement contains abstracts of the more important literature of the various phases of forestry, together with notes on the principal occurrences relating to forestry, hunting, and fishing during 1912. As in the last supplement, the international scope of the literature reviewed has been strengthened.

The present situation of forestry, H. S. GRAVES (*Proc. Nat. Conserv. Cong.*, 4 (1912), pp. 318-327).—An address on this subject delivered before the Fourth National Conservation Congress, Indianapolis, October, 1912, in which the author reviews the progress of federal and state forestry in the United States.

Forest map of Brazil, G. DE CAMPOS (*Relat. Min. Agr. Indus. e Com.*, Brazil, 1911, No. 3, pp. 1-98, pl. 1).—This comprises a map including descriptive text of the forest areas in Brazil, which has been prepared in connection with a proposed establishment of forest reserves in that country.

Reconnaissance in the Cotteswolds and the Forest of Dean, A. G. TANSLEY and R. S. ADAMSON (*Jour. Ecology*, 1 (1913), No. 2, pp. 81-89).—The results are given of a reconnaissance survey in the above-named forests with special reference to tree association and ground vegetation.

The forests and forestry of Germany, W. R. LAZENBY (*Pop. Sci. Mo.*, 83 (1913), No. 6, pp. 590-598, figs. 5).—A popular descriptive account.

Botanical and colonial economic studies of the bamboos, C. C. HOSSÉUS (*Bot. Centbl., Beihefte*, 31 (1913), 2. Abt., No. 1, pp. 1-69, figs. 12).—This paper, which consists largely of a compilation of information relative to the economic uses of the bamboo, was prepared with special reference to the extension of bamboo culture in the German colonies.

The culture of Manihot glaziovii in East Africa, P. JANSSENS (*Bul. Agr. Congo Belge*, 4 (1913), No. 3, pp. 670-689, pl. 1, figs. 13).—A report on the development of the plantation rubber industry in East Africa with special reference to Manihot rubber. Information is given relative to general cultural practices, tapping operations, rubber coagulation, and preparation for market.

On the economic value of sal (Shorea robusta), R. S. PEARSON (*Indian Forest Mem., Econ. Ser.*, 2 (1913), No. 2, pp. VI+76, pls. 8).—This work deals with the economic uses of the sal tree. The subject matter is discussed under the following general headings: The physical and mechanical properties of sal timber; the durability of sal timber; uses of sal timber and minor products obtained from the tree; sal fuel; and outturn and prices of sal timber.

The wild plants of the South Kamerun forests used by the natives, J. MILDBRAED (*Notizbl. K. Bot. Gart. u. Mus. Berlin*, 1913, App. 27, pp. 43).—This comprises a descriptive account of a large number of plants which are utilized by the Bulus in South Kamerun for various purposes.

The present status of the forest seed origin question, A. ENGLER (*Naturw. Ztschr. Forst u. Landw.*, 11 (1913), Nos. 10, pp. 441-463; 11, pp. 481-491).—A popular review of the author's long-continued investigations, previously noted (*E. S. R.*, 29, p. 841).

Coast sand dunes, sand spits, and sand wastes, G. O. CASE (*Surveyor*, 44 (1913), Nos. 1129, pp. 352-358; 1130, pp. 388-393; 1131, pp. 424-427; 1132, pp. 460-463; 1133, pp. 496-499; 1134, pp. 536-538; 1135, pp. 576-580; 1136, pp. 616-620; 1137, pp. 660-662; 1138, pp. 696-699, figs. 43).—This comprises a résumé of the work accomplished and the methods employed in various countries in the fixation of sand dunes and the reclamation of sand wastes, including many references to the literature on the subject.

Forest fires in North Carolina during 1912 and national and association cooperative fire control, J. S. HOLMES (*N. C. Geol. and Econ. Survey, Econ. Paper* 33, 1913, pp. 58, fig. 1).—In this paper the author gives a record of forest fires in North Carolina during 1912 with comparative data for previous years, together with a general account of the progress made in the control of forest fires by the federal and state agencies and by private associations.

In North Carolina the State has no organized fire protective system. The total loss from forest fires during the past 4 years is estimated at over \$2,500,000.

Practical experiences in the use of fluorids for wood preservation, R. NOWOTNY (*Ztschr. Angew. Chem.*, 26 (1913), No. 93, Aufsatzteil, pp. 694-700).—The author here presents data showing the results secured in different parts of Austria in the use of various fluorid compounds for preserving telegraph poles, etc. Summarizing the results as a whole the zinc fluorid and sodium fluorid compounds have proved to be strongly antiseptic against wood-destroying fungi and much superior to copper sulphate and zinc chlorid.

A number of references to the literature on the use of fluorid for preservative purposes are cited.

DISEASES OF PLANTS.

The fungus diseases of agricultural plants, J. ERIKSSON, trans. by A. Y. GREVILLIUS (*Die Pilzkrankheiten der landwirtschaftlichen Kulturpflanzen. Leipsic, 1913, pp. XVI+246, pls. 3, figs. 130*).—This is a German edition of a book previously noted (E. S. R., 28, p. 345).

Annual report on plant diseases, 1911, M. HOLLRUNG (*Jahresber. Pflanzenkrank., 14 (1911), pp. VIII+410*).—This report, published in 1913, continues the general plan of its predecessors (E. S. R., 28, p. 345), the literature cited for 1911 including 2,360 titles.

A preliminary host index of the fungi of Michigan, exclusive of the Basidiomycetes, and of the plant diseases of bacterial and physiological origin, G. H. COONS (*Rpt. Mich. Acad. Sci., 14 (1912), pp. 232-276*).—Lists are given of parasitic fungi observed as occurring on various host plants in Michigan.

Report on the work of the phytopathologist at Wageningen for 1911, J. RITZEMA BOS (*Meded. Rijks Hoogere Land, Tuin en Boschbouwsch. [Wageningen], 6 (1913), No. 3, pp. 105-163*).—This is an account of observations and experiments reported in relation to plant disorders due to inorganic agencies, attacks by plant or animal enemies, or undetermined causes.

Report of the botanical laboratory and laboratory for plant diseases, L. LINSBAUER, F. ZWEIFELT, and H. ZUDERELL (*Programm u. Jahresber. K. K. Höh. Lehranst. Wein u. Obstbau Klosterneuburg, 1912-13, pp. 159-178, figs. 3*).—A report is given on various investigations on plant diseases and insect pests, together with means adopted for their control. The principal investigations were carried on with those pests attacking orchard fruits, grapes, berries, potatoes, vegetables, and ornamentals.

Plant diseases observed in 1912 at the agricultural academy at Kolozsvár, B. GROF (*Kísérlet. Közlem., 16 (1913), No. 2, pp. 271-277, pl. 1*).—*Phoma fœniculina* is reported from the same locality as in the previous year. *Puccinia malvacearum* is said to infest not only *Althæa rosea nigra*, but also seriously *A. officinalis* in the neighborhood and sporadically *Malva sylvestris* and *M. vulgaris rotundifolia*, which are suspected to constitute a medium for the probable adaptation of this fungus for living on *A. officinalis*. *Plasmopara nivea* was noted on leaves of *Conium maculatum* living through the winter, appearing about May 15 and showing oospores about August 15. *Puccinia bullata* appeared about the same time on leaves, petioles, and twigs of the same host, showing its fruiting bodies about the same time and evidently inflicting considerable injury.

Agricultural botanical notes from the experimental plats at Ultuna, 1912, E. HENNING (*Sveriges Utsädesför. Tidskr., 23 (1913), No. 2, pp. 129-141, fig. 1*).—Discussions are given of the development of the winter wheat plants in the late fall of 1911. the size of leaves of the wheat varieties at time of blooming. mealy and glassy winter wheat kernels, the appearance of yellow and black rust (*Puccinia glumarum* and *P. graminis*) on small grains, and infection experiments with loose smut of barley (*Ustilago nuda*).

A contribution to the mycological flora of Russia, N. NAOUMOFF (*Bul. Trimest. Soc. Mycol. France, 29 (1913), No. 2, pp. 273-278, pl. 1; abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 4 (1913), No. 7, p. 1115*).—Preliminary to publication of a fuller list of collections in Russia, the author notes three species of fungi obtained in the summer of 1912, which are described under the respective names of *Bremia graminicola* n. sp. (on leaves of *Arthraxonis ciliaris*), *Cicinnobolus bremiphagus* n. sp. (pycnidia of which were attached to fruiting organs of *B. graminicola*), and *Rhodoseptoria ussuriensis* n. g. and sp., destroying leaves and fruit of the Manchurian plum.

Amygdalase and amygdalinase in *Aspergillus niger* and related Hyphomycetes, M. JAVILLIER and MME. H. TCHERNOROUTZKY (*Ann. Inst. Pasteur*, 27 (1913), No. 6, pp. 440-449).—The authors state, as the result of a study of *A. (Sterigmatocystis) niger* and some related fungi, that most of these are unequally rich in the two diastases, amygdalase and amygdalinase, a low percentage of zinc in the culture medium corresponding to a deficiency of both; also that in most of the fungi studied, the first named enzym predominates, the proportions varying somewhat with the age of a given culture.

Morphological alterations in *Aspergillus niger* grown in various acids and acid salts, A. KIESEL (*Ann. Inst. Pasteur*, 27 (1913), No. 6, pp. 481-488, pls. 2).—Pursuant to previous reports (E. S. R., 29, p. 734), the author figures and describes numerous alterations in mycelial growth and in cellular size, form, vacuolation, granulation, etc., noted in case of *A. niger*, grown in various media.

Some factors which influence the development of *Penicillium glaucum*, H. I. WATERMAN (*Over eenige factoren, die de ontwikkeling van *Penicillium glaucum* beïnvloeden. Proefschr. Tech. Hoogeschool Delft, 1913, pp. 157*).—Summarizing the results of an extended study of factors affecting the development of *P. glaucum*, the author states that the number and variety of organic compounds which in suitable concentration may serve as the carbon source in the development of *P. glaucum* is very large, but that highly oxidized compounds take no part in its development. The compounds which are harmless in moderate concentration are not all assimilable. A few aromatic compounds may serve as exclusive sources of organic nutriment for this fungus.

The occurrence of smut on the seed of some grasses, H. M. QUANJER (*Tijdschr. Plantenziekten*, 19 (1913), No. 5, pp. 137-152, pls. 2).—The author describes the occurrence of *Ustilago bromivora* on species of brome grass, particularly *Bromus unioloides*. It has been claimed that the beetle *Phalacrus curvatus*, through eating the spores of this smut, aids materially in keeping the disease under control, but the author believes that it is not so efficient as has been reported. For the control of the disease he recommends soaking the seed in a solution of copper sulphate or treating with hot water. Both of these methods have reduced the amount of smut, but the best results were obtained with the hot water treatment. Formaldehyde has also been recommended and has been used with some success.

The occurrence of rust spores in the interior of seeds of grasses, J. BEAUVERIE (*Compt. Rend. Acad. Sci. [Paris]*, 157 (1913), No. 18, pp. 787-790).—The author reports having observed pustules containing spores of rust in wheat, barley, *Bromus mollis*, and *Agropyron* spp. The presence of the rust in these seeds is believed by him to be of great importance when considered from the standpoint of the propagation of rusts.

Injury from rust fungi, D. HEGYI (*Kísérlet. Közlem.*, 16 (1913), No. 4, pp. 544-553).—Experiments are said to show that several common treatments for smut fungi are ineffective, but that treating the seed with either 1 per cent copper sulphate or 0.13 per cent formalin is safely protective. It is also stated that injury due to stinking smut is probably much greater than has hitherto been thought, requiring a more thorough study of this fungus.

Longevity of loose smut of barley in case of infected seed, H. ZIMMERMANN (*Ztschr. Pflanzenkrankh.*, 23 (1913), No. 5, pp. 257-260).—Reporting on a continuation of work previously noted (E. S. R., 25, p. 244), the author gives tabular results of experimentation with 18 varieties of barley during 1908 to 1912. He concludes that the ability of *Ustilago hordei* to develop loose smut in barley appears to depend largely upon the stage of development of the variety in question, the time as well as the violence of attack varying in dif-

ferent seasons; also that the smut may remain capable of development for about five years.

Effects on winter rye and wheat of treatment with corrosive sublimate, L. HILTNER (*Prakt. Bl. Pflanzenbau u. Schutz, n. ser.*, 11 (1913), No. 8, pp. 101-104).—Continuing previous reports (E. S. R., 28, p. 846), the author gives the results of numerous practical experiments reported by farmers with the corrosive sublimate treatment. This is said to have been beneficial to both wheat and rye against *Fusarium*, but not against loose smut of wheat.

Corrosive sublimate as treatment for rye, K. GRÄF (*Prakt. Bl. Pflanzenbau u. Schutz, n. ser.*, 11 (1913), No. 8, pp. 97-101, figs. 4).—Very favorable results are reported as following the use of corrosive sublimate against *Fusarium* on seed grains of winter rye in 1912 as recommended by Hiltner. The effects of Sublimiform on the spring planting were not very decided, possibly on account of weather unfavorable to the development of the fungus.

The effect of formalin and copper sulphate solution on the germination of wheat, C. C. BRITTLEBANK (*Jour. Dept. Agr. Victoria*, 11 (1913), No. 8, pp. 473-476, figs. 2).—The results are given of an experiment undertaken to ascertain the effect of time on the germination of wheat after treatment with formalin and copper sulphate solutions. Equal quantities of seed were soaked for 5 minutes in a solution of formalin, 1:300, and for 1 minute in a 2 per cent solution of copper sulphate. The seed was then removed from the solutions, dried, placed in clean bags, and tested at weekly intervals for 54 weeks.

Marked differences in vigor and growth of the plants were noted from the first. The control lot was the quickest to germinate, and gave an average of 95 per cent germination for the entire period. Next in germination and vigor was the seed treated with formalin solution, for which an average germination of 91 per cent was found. The highest percentage of germination for copper sulphate was 95 per cent at the end of the first week. Following this there was a gradual reduction in viability until at the end of the period only 32 per cent germinated.

This experiment indicates that seed should be sown as quickly as possible after treatment.

Connection between the acidity of the cell sap and rust resistance in wheat, O. COMES (*Atti R. Ist. Incoragg. Napoli*, 6. ser., 64 (1912), pp. 418-441; *abs. in Internat. Inst. Agr. [Rome]*, *Mo. Bul. Agr. Intel. and Plant Diseases*, 4 (1913), No. 7, pp. 1117-1119).—This work, dealing with results obtained previously by the author and others, is believed to justify the general conclusion that the biochemical factor which constitutes the means of resistance of an organ to disease may be estimated from the acidity of the cell sap; that this acidity, rather than density and compactness of tissues, enables plants to resist parasitic fungi; and that the normal production of sap more or less rich in sugars or in acid is hereditary, but capable of modification by cultivation, manuring, and elevation. It is claimed that the farmer should give attention to biological means, such as hybridization and selection, in order to increase the resistance of improved plants, in this way seeking to discover the varieties resistant for a given district. In order to preserve the highest degree of acidity in the cell sap and at the same time maintain fertility of soil the phosphatic fertilizers, especially superphosphates, should be used instead of nitrogenous manures.

Foot disease of wheat, REUTHER (*Deut. Landw. Presse*, 40 (1913), No. 65, p. 780).—This brief discussion of the appearance, predisposing conditions, and probable causes of foot or stalk disease of wheat, concludes with recommendations looking to protection therefrom, the principal of which are included in

careful selection and preventive treatment of seeds, sparing use of nitrogenous manures, suppression of weeds, rotation, and proper drainage.

Observations on foot disease of wheat, REUTHER (*Illus. Landw. Ztg.*, 33 (1913), No. 65, pp. 589-591).—The main substance of this report is contained in the article noted above.

Nematode disease of wheat, J. APPL (*Wiener Landw. Ztg.*, 63 (1913), No. 69, p. 787, figs. 3).—The author reports briefly on infection and other studies carried out on wheat in relation to *Tylenchus tritici* in Austria.

The nematodes are said to invade the seedling from the soil when very young and to be carried upward with its growth, breeding in immense numbers in the galls found in the heads. It is supposed, however, that they can infect young plants only at short distances (probably not over 10 cm.) from the original host plants. The galls, however, which are said to be almost the sole means of spreading the infection, are distributed and sown with the seed wheat, but it is suggested that by winnowing and other means they may be largely removed, lessening greatly the danger from nematodes.

A disease of peanuts, A. A. L. RUTGERS (*Dept. Landb., Nijv. an Handel [Dutch East Indies], Meded. Afdeel Plantenziekten*, 1913, No. 6, pp. 5, pls. 2).—A description is given of a disease of peanuts in Java that is believed to be identical with that described by Zimmerman from German East Africa (E. S. R., 19, p. 448). No organism has been definitely determined as causing the disease, and experiments on its transmission and control have given negative results.

In addition to the peanut, the mungo bean (*Phaseolus mungo*), *Dolichos biflorus*, *Crotalaria verrucosa*, and probably *Triumfetta rhomboidea* are believed to be subject to this disease.

A contribution on changes in fleshy organs of plants due to micro-organisms, L. HAUMAN-MERCK (*Ann. Inst. Pasteur*, 27 (1913), No. 7, pp. 501-522).—As the result of a study of the relations between several fleshy plants and the organisms attacking them, the author states that in Argentina, as in North America, winter potato rot is caused by *Mucor stolonifer*; that infection, though ordinarily easy and quick in case of contused wounds, is unlikely in case of cut though unbruised tissues exposed to air, on account of rapid cicatrization in such cases; that whatever prevents or hinders such cicatrization in roots, tubers, leaves, etc., favors their immediate infection and possibly the development also of substances unfavorable to suberization; that, therefore, attack of an organ through a wound or bruise seems to depend upon the relative rate of development of the saprophyte in the superficial layers of contused cells and of suberin in the layers immediately beneath.

Leaf roll of potatoes, VI, G. KÖCK, K. KORNAUTH, and O. BROŽ (*Ztschr. Landw. Versuchsw. Österr.*, 16 (1913), No. 3, pp. 89-140, pl. 1, fig. 1; *abs. in Bot. Centbl.*, 123 (1913), No. 8, p. 200).—The authors give results of their 1912 studies on potato leaf roll, which are said to confirm those previously given (E. S. R., 27, p. 447). The trouble is claimed to be due to a parasitic *Fusarium*, which may invade the plant directly from the soil (primary infection), spreading in the vascular bundles to or throughout the tubers and developing in varying degree in the plants produced therefrom (secondary infection); or, not reaching the tubers but interfering with their nutrition, may simply dwarf these and successive crops therefrom. This trouble is claimed to be distinct from some others which wither or crinkle the leaves. It appears either early or late in the growing period. Numerous infection studies succeeded in reproducing the disease. No close relation to weather has been determined.

A list of the 1912 literature on this subject is appended.

Disorders and parasites of rice, L. GRANATO (*Bol. Agr. [Sao Paulo]*, 14. ser., 1913, No. 1, pp. 1-17).—This is a somewhat systematic general account of rice disorders as observed in Sao Paulo in recent years, including some observations on animal and cryptogamic parasites.

A sclerotial disease of rice, F. J. F. SHAW (*Mem. Dept. Agr. India, Bot. Ser.*, 6 (1913), No. 2, pp. 11-23, pls. 3).—The author states that *Sclerotium oryzae* has recently been demonstrated on rice in India, the attack manifesting itself through extensive tillering from the base of the infected culm. Inoculated laboratory plants died, while infected field plants were only weakened, failing to produce good seed. The fungus is said to show, according to the various substrata used, decided differences, these being most marked in the color and form of the hyphae. No trace of a perfect stage was observed. The sclerotia are thought to winter in the soil and to be practically beyond the reach of ordinary remedies. The breeding of resistant varieties of rice is suggested.

A bibliography is appended.

A disease of rice (*Agr. News [Barbados]*, 12 (1913), No. 298, p. 318).—This is a summary of the article above noted.

History of root rot or red rot of beets, A. STIFT (*Bl. Zuckerrübenbau*, 20 (1913), No. 15, pp. 225-230).—The author gives a condensed account of efforts to check this disease and of related writings during the last 60 years, closing with a reference to the means recommended by Eriksson (*E. S. R.*, 29, p. 50) for its control.

Recent studies with fertilizers as protective to beets against dry rot, heart rot, and nematodes, R. SCHANDER (*Bl. Zuckerrübenbau*, 20 (1913), No. 11, pp. 169-173; *Deut. Zuckerindus.*, 38 (1913), No. 7, pp. 154, 155; *abs. in Centbl. Bakt. [etc.]*, 2. Abt., 38 (1913), No. 7-12, pp. 246, 247).—The author states that calcium sulphate was ineffective as used against heart rot and dry rot of beets; that the free use of potassium, nitrogen, and phosphorus fertilizers increased considerably the yield of the beet crop on ground infested with nematodes; that shallow plowing as protection against nematodes was ineffective, proving also injurious to the beet crop where the above-named rots prevailed, and that the Kühn method of trap plants seems to be of limited adaptability for this purpose.

Protection against nematode injury, W. KRÜGER (*Centbl. Zuckerindus.*, 21 (1913), No. 15, p. 515; *abs. in Centbl. Bakt. [etc.]*, 2. Abt., 38 (1913), No. 7-12, pp. 167, 168).—In continuation of previous notes (*E. S. R.*, 27, p. 152) the author, discussing nematode injury to the beet crop and some difficulties of protection therefrom, states that field experiments have been continued at the experiment station at Bernburg to test the effects, as regards protection, of variations in soil absorptivity, in case particularly of phosphorus and potassium and in general of the more available compounds. It is held that loss as regards quantity and quality of the product is less when the supply of available nutriment is more plentiful.

Tomato diseases, T. C. WEBB (*Jour. Agr. [New Zeal.]*, 7 (1913), No. 1, pp. 46-52, figs. 2).—The results of experiments for the control of tomato diseases on plants grown under glass are given.

The tomatoes were sprayed with different fungicides, and from January until April were kept free from disease by the use of either Bordeaux mixture or Burgundy mixture. After April 5, owing to other work, a period of 3 weeks elapsed without spraying, when the tomato spot (*Cladosporium fulvum*) appeared on all the plants. Spraying with Bordeaux mixture at 10-day intervals held the disease in check, but the use of Burgundy mixture after April 5 was without any advantage.

The relation of fertilizers, temperature, and humidity to the disease are discussed and descriptions are given of nematode attacks, tomato spot, a disease called black stripe, and white fly injury.

Regarding the relation of fungus attack upon the foliage of trees to disturbances in roots and lower trunk, R. FARNETI (*Riv. Patol. Veg.*, 6 (1913), No. 4-5, pp. 97-107).—Discussing numerous examples cited, the author claims that functional disturbances, debility, and bad constitutional conditions generally do not necessarily predispose trees to fungus attack.

Diseases of the orchard, L. CAESAR (*Ann. Rpt. Fruit Growers' Assoc. Ontario*, 44 (1912), pp. 22-25, figs. 4).—Notes are given on black rot canker, apple scab, and pear blight, with suggestions for their control.

The transpiration of apple leaves infected with *Gymnosporangium*, H. S. REED and J. S. COOLEY (*Bot. Gaz.*, 55 (1913), No. 6, pp. 421-430, fig. 1).—Substantially noted from another source (*E. S. R.*, 29, p. 647).

The apple rust (*Rpt. W. Va. Dept. Agr.*, 1913, No. 29, pp. 20-24, fig. 1).—In a paper presented before the twentieth annual meeting of the State Horticultural Society attention is called to the rust of apples and its related form on cedars, with the object of reducing the occurrence of the disease as much as possible by the removal of cedar trees in the vicinity of orchards. It is stated that the disease can be controlled by proper spraying, but as the period when the application of the fungicide should be made is quite limited a more practical method of control is believed to be the elimination of the cedar trees.

The collar blight of apple trees, N. J. GIDDINGS (*Rpt. W. Va. Dept. Agr.*, 1913, No. 29, pp. 15-19, fig. 1).—In a paper presented before the twentieth annual meeting of the State Horticultural Society, the author states that three troubles of apple trees, collar blight, winter injury, and root rot, are frequently met with and often confused.

The collar blight disease, it is said, may be detected in its early stages by a close inspection of each individual tree. The affected trees usually show a discolored area of bark just above the ground, and the bark is frequently sunken. By cutting into the bark it is found to be dead and black, and a reddish discoloration is observed where the wood and bark come together. At later stages in the progress of the disease the dead bark often becomes broken up and rot fungi easily gain access. An examination was made of a number of orchards, and a considerable proportion of trees of bearing age was found affected.

The only remedy at present known is that of cutting out and treating the diseased areas. Differences are noted in the susceptibility of varieties of this trouble, and it has been suggested that double working nursery stock has given relief.

A bacterial canker of plum twigs, I. M. LEWIS (*Trans. Amer. Micros. Soc.*, 31 (1912), No. 3, pp. 145-149, pl. 1).—The author states that a disease of plum trees, popularly known as canker, is quite prevalent in portions of Texas and is apparently identical with that which has been reported from Nebraska and Delaware (*E. S. R.*, 18, p. 244; 19, p. 445). Small cankers are observed on the wood of the first season's growth, and these enlarge until finally the twigs may become completely girdled.

A bacterium (*Pseudomonas pruni*) has been isolated and cultivated, and inoculation shows that it is responsible for the trouble. In addition it was found possible to produce typical cankers on young peach trees with the organism taken from the plum.

Physiopathological observations on the stigma of the olive flower, L. PETRI (*Mem. R. Staz. Patol. Veg. Roma*, 4 (1913), pp. 139-160, figs. 7; abs. in

Internat. Inst. Agr. [Rome], *Mo. Bul. Agr. Intel. and Plant Diseases*, 4 (1913), No. 7, pp. 1113, 1114).—It is stated that among the external causes which may provoke alteration in the stigmatic papillæ and bring about their death are rain and mist, which act by wetting the stigma and causing arrest or excessive reduction of the activity of respiration, transpiration, and assimilation, by bringing about a toxic accumulation of oxalic acid.

The biology of *Cycloconium oleaginum*, L. PETRI (*Mem. R. Staz. Patol. Veg. Roma*, 1913, pp. 136, figs. 37; *abs. in Internat. Inst. Agr. [Rome]*, *Mo. Bul. Agr. Intel. and Plant Diseases*, 4 (1913), No. 7, pp. 1116, 1117).—The author gives results of studies carried on since 1905 with cultures of *C. oleaginum*, and discusses artificial nutritive media, germinating conditions of the conidia, enzym action of the fungus upon the cuticle of the olive leaves, and localization and development of the disease as related to conditions of receptivity in the leaves.

It is stated that *Cycloconium* can grow saprophytically, forming in cultures its chlamydospores and microsclerotia, the conidia forming only in case of an acid substratum. Conidia are said to germinate at temperatures between 2 and 32° C., but cultures may live at -15°.

Two enzymes, pectin and lipase, were isolated from the cultures, but no toxic substances were shown to be elaborated by the mycelium. This fungus does not develop on leaves which are about to fall. Its germination at low temperatures and the physiological conditions of the leaves in winter render infection at that season possible, especially in southern and littoral districts.

Diseases and enemies of cacao, L. BEILLE (*Jour. Agr. Trop.*, 13 (1913), Nos. 144, pp. 167-172; 145, pp. 193-197; 146, pp. 236-238).—Besides a brief notice of general disorders which may be more or less common to roots, stems, branches, leaves, and fruit of cacao trees, a discussion is given of certain diseases peculiar to each part, including more or less of the history, cause, symptoms, remedies, etc. A section is devoted to animal pests of the cacao tree.

Premature leaf fall of currant bushes, E. NOFFRAY (*Jour. Agr. Prat.*, n. ser., 26 (1913), No. 35, pp. 272, 273; *Rev. Hort. [Paris]*, 85 (1913), No. 18, pp. 426, 427).—The author discusses briefly an attack of *Glæosporium ribis* on leaves of currant bushes, causing their early fall, followed by the development on the fallen leaves of *Pseudopeziza ribis*, said to be the perfect form of *G. ribis*.

Raspberry yellows and cane blight, J. E. HOWITT (*Canad. Hort.*, 36 (1913), No. 10, pp. 237, 238).—Descriptions are given of two serious diseases of raspberries that are said to be prevalent in Ontario.

The first, the cause of which is not determined, is called raspberry yellows from the general appearance of the affected plants. The first indication of the presence of this disease is said to be the curling downward of the margin of the upper leaves which later become mottled with yellow. As the disease progresses the plants become stunted and yellow and the berries dry up without ripening. This disease spreads rapidly through a plantation, and as yet no definite remedy is known.

The cane blight is due to a fungus, but it is not so widespread nor so serious as the yellows.

For both diseases the planting of healthy plants and the removal and burning of diseased specimens are about the only methods of control that are promising. the use of Bordeaux mixture or other sprays having failed to hold the diseases in check.

Treatment of court-noué with coal tar, LAMOUREUX (*Prog. Agr. et Vit. (Ed. l'Est-Centre)*, 34 (1913), No. 40, pp. 417-421, figs. 2).—A brief account is given with illustrations of the method and results of applying coal tar to grapevines

dwarfed by court-noué. The vines showed improvement the first year, and more decidedly the second year. After the third year's treatment the recovery is considered to be complete, the new growths being apparently normal as to development and product.

Development of downy mildew as related to conditions of the medium, O. MENDEL (*Compt. Rend. Acad. Sci. [Paris]*, 157 (1913), No. 4, pp. 292-294).—Observations made at the station for agricultural meteorology at Perpignan are said to show that in this region, where the winds predominant in periods of mildew outbreak are from the sea, the localities of greatest infection are the elevations most exposed to sea winds presumably bearing comparatively few spores; this is apparently because of the greater humidity and warmth, favoring germination. In the observation period in question it is held that the two days of northwest showers conferred receptivity upon the grape stocks and that three days of warm moist winds from the northeast and southeast developed the infection.

Summarizing the conclusions arrived at from recent studies, the author concludes that the presence of mildew and degree of its attack depend upon general causes, such as variations of atmospheric conditions, which may be widespread; upon secondary causes, including such factors as the nature and vitality of the stock, the composition of the soil, and exposure of the situation; and upon accidental causes, such as fertilizers, dressings, and the presence of overflow water.

The white rot of grapes and its treatment, L. DEGRULLY (*Prog. Agr. et Vit. (Ed. l'Est-Centre)*, 34 (1913), No. 36, pp. 289-291, pl. 1).—According to the author, the white rot due to *Coniothyrium diplodiella* is particularly destructive to the fruit of certain varieties of grapes. The fungus is considered to be semiparasitic, usually attacking the fruit and vine through wounds.

Spraying for black rot or mildew will at the same time protect against the occurrence of the white rot. The fungicides for this purpose should contain a large amount of copper.

This fungus, unlike the *Botrytis* which causes the gray rot, is said not to produce any oxidizing enzymes, and as a result does not affect wine.

Diseases of *Azalea indica*, H. BEHNSEN (*Gartenwelt*, 17 (1913), No. 36, pp. 499, 500).—A brief discussion is given of the injury to *A. indica* by *Puligo septica*, requiring the removal of the slime mass and application of potassium nitrate; by *Septoria azaleæ*, Bordeaux mixture of 1 per cent strength being recommended as a preventive measure; by an *Exobasidium* of undetermined species, no remedy being prescribed; and by leaf fall ascribed to means used for securing rapid growth. Several injurious animals are briefly discussed.

Carnation stem rot, H. W. ANDERSON (In *Floriculture Research at the Experiment Station. Urbana: Univ. Ill.*, 1912, pp. 15-22).—This is a paper presented before the annual meeting of the Illinois State Florists' Association and consists of an account of observations and experiments on the carnation stem rot due to *Rhizoctonia*. An outline is given of experiments in progress relating to this disease, and a number of other fungus troubles are briefly mentioned.

Infection experiments with *Phoradendron villosum*, K. VON TUBEUF (*Naturw. Ztschr. Forst u. Landw.*, 11 (1913), No. 3, pp. 171, 172; *abs. in Bot. Centbl.*, 123 (1913), No. 12, p. 294).—Attempts to grow *P. villosum* on several European trees named gave no further results in any case than germination of the mistletoe seed. See also a previous note (E. S. R., 29, p. 243).

Notes on black canker of chestnut, E. BARSALI (*Riv. Patol. Veg.*, 6 (1913), No. 4-5, pp. 107-110).—Referring to recent reports by Petri (E. S. R., 29, p. 156) and others on black canker of chestnut, the author contributes some observations

regarding the presence and effects of *Coryneum* and other fungi on chestnut trees, stating no absolute conclusion at this time, but insisting on early attention being given to the root system in this connection.

Cryptogamic leaf diseases of *Hevea* in America, V. CAYLA (*Jour. Agr. Trop.*, 13 (1913), No. 144, pp. 186-188).—The author, noting briefly several studies made on the parasitism of *H. brasiliensis*, states that *Dothidella ulei* appears to attack most readily and severely plants reduced in vitality by unfavorable conditions. The disease is reported from the upper Amazon, but not in very severe form.

A blight of the mesquite, F. D. HEALD and I. M. LEWIS (*Trans. Amer. Micros. Soc.*, 31 (1912), No. 1, pp. 5-10, pl. 1).—A disease of mesquite (*Prosopis glandulosa*) has been under the authors' observation for several years. It is said to be quite abundant in the vicinity of Austin, Tex., and thought probably to occur throughout the range of this species.

The leaves are affected soon after the leaflets attain mature size, and in the early stages the leaflets show a form of chlorosis which begins at the margin and tip and advances until the midrib is reached. The general condition is such as is popularly designated as rust.

The fungus could not be referred to any known genus, and the authors have proposed for it the name *Scleropycnium aureum* n. g. and sp., a technical description of which is given.

The occurrence of the larch canker on Corsican pine, A. D. HOPKINSON (*Quart. Jour. Forestry*, 7 (1913), No. 4, pp. 287-290, pls. 2).—The author reports on the prevalence of the larch canker (*Dasyscypha willkommii*) on the Corsican pine. Of 100 trees examined, 90 showed signs of having been attacked by the fungus, but a few of the larger specimens that had been infected had overcome the disease and the wounds had begun to heal. In addition to the Corsican pine (*Pinus laricio*), this fungus is said to attack also the Scotch pine (*P. sylvestris*) and the Austrian pine (*P. austriaca*) in the same neighborhood.

An adherent spraying liquid, A. LECOMTE (*Rev. Vit.*, 40 (1913), No. 1027, pp. 225-228).—Noting the contributions of Vermorel and Dantony (*E. S. R.*, 29, p. 850) in regard to employment of casein to promote adherence in fungicidal sprays, the author reports the successful use for this purpose of this substance in its natural solution, milk. The mixture, it is claimed, was found to be entirely homogeneous when made with the percentage of copper usual in such sprays. A mixture of 2 per cent copper sulphate, 1 per cent lime, and 2 per cent milk in the aqueous solution is said to be satisfactorily adherent and not prohibitively expensive under favorable circumstances.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

A text-book of agricultural zoology, F. V. THEOBALD (*Edinburgh and London*, 1913, 2. ed., rev., pp. XX+536, figs. 257).—A revised edition of this work (*E. S. R.*, 11, p. 427).

The present status of the heath hen, G. W. FIELD (*Bird Lore*, 15 (1913), No. 6, pp. 352-358, figs. 9).—This paper relates to the occurrence of the heath hen, which has been exterminated except upon Marthas Vineyard. It is stated that 6 years' experience proves that the protected reservation is an efficient method for increasing the numbers of this grouse without artificial propagation.

The destruction and dispersal of weed seeds by wild birds, W. E. COLLINGE (*Jour. Bd. Agr. [London]*, 20 (1913), No. 1, pp. 15-26).—In order to determine to what extent birds are instrumental in disseminating weed seeds, droppings were collected and placed upon sterilized soil and covered with a little fine soil. One hundred and thirty-three plants representing 7 species developed from 54

droppings of the house sparrow; 52 plants representing 7 species developed from 38 droppings of the greenfinch; and 96 plants representing 9 species developed from 50 droppings of the bullfinch.

In the discussion the author reviews and quotes from the literature on the subject.

The food of some British wild birds, W. E. COLLINGE (*London, 1913, pp. VII+109*).—This work is based upon investigations extending over many years, during which period numerous observations were made in the field and of the stomach contents of upwards of 3,000 adult birds and 300 nestlings. Among the more important subjects dealt with are methods of examination, including observations of the food of nestling birds (E. S. R., 28, p. 450); results of studies of the food of 29 species of birds; birds as destroyers and as distributors of weed seeds, as noted above; birds in relation to forestry; legislation; protective measures; etc.

A bibliography of 114 titles is appended and an index is included.

[Animal pests, etc., in Colorado] (*Off. State Ent. Colo., 1913, Circs. 7, pp. 85, figs. 10; 8, pp. 13, figs. 3; 9, pp. 8, pl. 1, fig. 1*).—Of these circulars (E. S. R., 28, p. 450), No. 7 consists of the Fourth Annual Report of the State Entomologist for the year, 1912, by C. P. Gillette and G. P. Weldon; No. 8, a Report on Prairie Dog Investigations in Colorado, in continuation of work previously noted (E. S. R., 28, p. 652); and No. 9, a discussion of The Wyoming Spermophile or Ground Squirrel (*Citellus elegans*), the last two circulars being by W. L. Burnett. Reports upon the orchard, nursery, nursery stock, and apiary inspection work during the year, and papers on the fruit tree leaf roller in Colorado (E. S. R., 28, p. 450) and upon rodent investigations for 1912 (E. S. R., 28, p. 652) are included in the entomologist's report.

[Notes on insects of economic importance in Germany], K. ESCHERICH and W. BAER (*Naturw. Ztschr. Forst u. Landw., 11 (1913), Nos. 2, pp. 98-109, figs. 3; 3, pp. 121-128, figs. 2; abs. in Rev. Appl. Ent., 1 (1913), Ser. A, No. 10, pp. 371-373*).—These notes relate to the sawfly *Pachynematus montanus* as a new enemy of the pine; the pine as a food of *Lophyrus hercyniæ*; the number of eggs deposited by *Lyda stellata*; injury of *Hepialus humuli* to the hickory (*Carya alba*); the longicorn beetle *Ergates faber* as a pest of pine fence posts, etc.; and a heavy infestation by *Palæococcus fuscipennis*.

Insects injurious to sugar cane in British Guiana, and their natural enemies, G. E. BODKIN (*Jour. Bd. Agr. Brit. Guiana, 7 (1913), No. 1, pp. 29-32*).—This paper lists 32 species of insects injurious to sugar cane in British Guiana and their natural enemies.

Insects attacking the pine, P. LESNE (*Jour. Agr. Prat., n. ser., 25 (1913), Nos. 6, pp. 179-182, pl. 1; 7, pp. 213-215, fig. 1*).—This is a brief account of the more important insect enemies of the pine in France.

Insects and disease, C. WELLMAN (*Amer. Jour. Trop. Diseases and Prev. Med., 1 (1913), No. 5, pp. 346-350*).—A brief discussion with references to the literature.

Infectious diseases and invertebrate transmitters, F. MESNIL (*Bul. Inst. Pasteur, 11 (1913), Nos. 5, pp. 185-196; 6, pp. 233-244*).—This paper presents a list of the invertebrates concerned, and a review of the infectious diseases conveyed by insects and other invertebrates and of the invertebrates and the micro-organisms which they convey. A bibliography of 61 titles is appended.

[Plant inspection in Florida], E. W. BERGER (*Univ. Fla. Off. Insp. Nursery Stock, 1911, Circs. 1, pp. 8; 2, p. 1; 1912, Circs. 3, pp. 15, fig. 1; 4, p. 1; 1913, Circ. 5, pp. 2*).—These circulars relate to the rules and regulations governing plant inspection work in Florida.

East African termites, H. MÖRSTATT (*Pflanze*, 9 (1913), Nos. 3, pp. 130-141, pls. 3; 9, pp. 443-464, pls. 3).—The first part of this paper consists of a general discussion of termites; the second part relates to the Natal termite (*Termes natalensis*) and other species which attack rubber trees.

The croton bug (*Ectobia germanica*) as a factor in bacterial dissemination, W. B. HERMS and Y. NELSON (*Amer. Jour. Pub. Health*, 3 (1913), No. 9, pp. 929-934, fig. 1).—It is pointed out that the croton bug (*E. germanica*), which feeds by preference upon the food of man, is commonly found in situations where infective sputum or excrement exists, and that it is structurally equipped to collect filth and bacteria upon its appendages, though this equipment is not as effective as in the house fly. It has the ability to pick up bacteria on its feet and mouth parts and deposit these on human food. The bacterial population of a single croton bug was found to be a minimum of 13,370 bacteria.

"The croton bug carries more bacteria upon its hind pair of legs than on its middle and fore legs combined. The croton bug is normally nocturnal in habit though it may be active during the day, and is more or less omnivorous in food habit. The eggs of the roach are laid in pairs (13 pairs usually) in an egg case which is carried for several months by the female. The young roaches require evidently not less than one year to mature and probably more.

"The usual trapping methods are not very effective in the control of the croton bug. Sweet mixtures containing borax or flour and plaster of Paris with water available are recommended as good remedies."

Monograph of the Gryllidæ of Formosa with a review of the Japanese species, T. SHIRAKI (*Monographie der Grylliden von Formosa, mit der Uebersicht der Japanischen Arten. Taihoku, Formosa: Govt., 1911, pp. 129, pls. 2*).—A synopsis of the family in which a large number of species are described as new.

Nine new Thysanoptera from the United States, J. D. HOOD (*Proc. Biol. Soc. Wash.*, 26 (1913), pp. 161-166).—Of the nine species here described as new *Liothrips montanus* from the currant and gooseberry at Bozeman, Mont., is of economic importance.

The thysanopterous cecidia of Java and their inhabitants, H. KARNY and W. and J. VAN LEEUWEN-REIJNVAAN (*Bul. Jard. Bot. Buitenzorg*, 2. ser., 1913, No. 10, pp. 126, figs. 86).—The authors first discuss the cecidia from a botanical standpoint (pp. 1-54), following which they deal (pp. 55-123) with the 47 species and subspecies of thrips concerned, of which 20 forms are described as new.

Froghoppers, J. C. KERSHAW (*Dept. Agr. Trinidad and Tobago Bul.*, 12 (1913), No. 72, pp. 3-12, pls. 3).—These miscellaneous notes make up Special Circulars 3 to 7.

The vermilion egg parasite of the froghopper has not been reared in captivity during the dry season in sufficient numbers to give any great encouragement that it will check the froghopper. In addition to the use of the green muscardine fungus, which has given good results in the past and is now being used on a large scale, the author suggests 3 other means of combating the pest, (1) the application of nitrolim (calcium cyanamid); (2) kerosene-lysol emulsion (lysol 3 oz., kerosene 9 oz., and water 4 gal.); and (3) the removal and destruction of dry leaves on which the eggs may have been deposited. The notes include a discussion of the male genital armature of *Tomaspis*.

The sugar cane froghopper and biological notes on some cercopids of Trinidad, F. W. URICH (*Dept. Agr. Trinidad and Tobago Bul.*, 12 (1913), No. 72, pp. 12-51, pls. 7, figs. 9).—This report reviews records of froghoppers in other countries; gives a discussion of the origin and distribution of the sugar cane froghopper, its life history and habits, natural enemies, and artificial

control; and biological notes on *Tomaspis rubra sororia*, *T. pubescens*, *T. guppyi* n. sp., *T. postica*, and *Clastoptera lenata*.

[Froghoppers in Trinidad], J. C. KERSHAW ET AL. (*Dept. Agr. Trinidad and Tobago Bul.*, 12 (1913), No. 73, pp. 95-106, pls. 2, figs. 12).—These notes relate to mating, oviposition, estivation of eggs, manner in which the froghopper feeds, the green muscardine fungus, etc.

Rearing of the vermilion froghopper egg parasite, F. W. URICH (*Bd. Agr. Trinidad and Tobago, Circ.* 7, 1913, pp. 7; *abs. in Rev. Appl. Ent.*, 1 (1913), Ser. A, No. 4, pp. 116, 117).—The methods employed in rearing the egg parasite of this froghopper in Trinidad are described.

The froghopper egg parasite (*Oligosita giraulti*) and its colonization in the cane fields, F. W. URICH (*Bd. Agr. Trinidad and Tobago, Circ.* 11, 1913, pp. 9).—This paper presents additional data on the froghopper egg parasite, which has been described by Crawford as *O. giraulti*. It embodies the results of rearings of the parasite under laboratory conditions from February to June, including notes on its life history, habits of the adult parasite, multiplication, etc.

On a remarkable gall-producing psyllid from Syria, R. NEWSTEAD and B. F. CUMMINGS (*Ann. and Mag. Nat. Hist.*, 8, ser., 11 (1913), No. 63, pp. 306-308, pl. 1, fig. 1).—The author describes a pod-shaped gall, found some 8 miles from Beyrout on a twig of what is thought to be a tamarind, and the larvæ and pupæ of a species of psyllid belonging to the subfamily Trioziinæ, which it contained.

The rosy apple aphid (*Aphis sorbi*), serious pest, H. F. WILSON (*Better Fruit*, 7 (1913), No. 12, pp. 17, 18).—This aphid is said to be by far the most serious plant louse attacking fruit trees in Oregon. The species, a native of Europe, probably imported to this country on nursery stock, has now spread to most of the apple-growing sections of the United States, and is said to be generally distributed in Oregon.

In this paper the author reports studies of its life history and habits so far as determined during 2 seasons' work. The winter is passed in the egg stage, the stem mothers hatching out just as the buds begin to open in the spring. The aphids usually attack the leaves surrounding the fruit clusters, but in years when the crop is light may be found almost anywhere on the leaves. Their attacks result in the production of deformed apples, this apparently being due to the extra supply of juices drawn into the leaves and absorbed by the aphids. Unlike the green apple aphid this species seldom attacks the young growing shoots.

In experiments conducted during the spring of 1911 applications of blackleaf 40 and of blackleaf 40 combined with lime-sulphur have been found to be efficient, but lime-sulphur (1:10) alone failed to have any effect upon the aphids. It is stated that spray thoroughly applied at the time the buds are commencing to open will prevent from 95 to 100 per cent of aphid infestation.

Report on the distribution of the grape phylloxera (*Phylloxera vastatrix*) in Austria in 1910, 1911, and 1912, as well as on the work and results secured in reestablishing infested vineyards, together with the laws, orders, and exemptions dealing with the phylloxera (*Ber. Verbr. Reblaus Österr.*, 1910-1912, pp. 332, pl. 1).—This report, which covers the various grape growing centers of Austria, is in continuation of the report previously noted (E. S. R., 25, p. 341).

The beet plant louse in northern France, A. MALAQUIN and A. MOITRIÉ (*Vie Agr. et Rurale*, 2 (1913), No. 24, pp. 696-699, figs. 7; *abs. in Internat. Inst. Agr. [Rome]*, Mo. Bul. Agr. Intel. and Plant Diseases, 4 (1913), No. 7, p. 1125).—*Aphis papaveris* has appeared in large numbers in northern France during the

last few years, especially in 1911, and has been a source of considerable damage to beets. The authors confirm the observations of Mordwilko, who considers this species to be the same as that found on *Euonymus europæus* in spring and known as *A. euonymi*.

Notes on coccids which attack the coconut palm and other plants cultivated on a large scale in Mahé, Seychelles, P. R. DUPONT (*Abs. in Rev. Appl. Ent.*, 1 (1913), Ser. A, No. 4, pp. 129, 130).—Seven species of *Lecanium* are mentioned as occurring in the Seychelles. A species of fungus of the genus *Hypocrella* is said to attack these scales; a species of *Microcera* attacks *Diaspis pentagona*, which injures the leaves of plum trees and the trunks of papaws; and *Cephalosporium lecanii* parasitizes *Lecanium viride*, which has caused the disappearance of almost all the thorn-bearing trees in the Colony.

Some field notes on a soft gray scale known locally as the "longulus" scale, D. KELL (*Mo. Bul. Com. Hort. Cal.*, 2 (1913), No. 8, pp. 617-619).—Biologic notes and a brief report in tabular form upon experimental fumigation work are given. See also a previous note (E. S. R., 28, p. 452). The results indicate that there is a good chance of obtaining a fairly high destruction of this scale by fumigating between July 20 and the end of August.

The tobacco caterpillar (*Prodenia litura*), C. R. JONES (*Philippine Agr. Rev. [English Ed.]*, 6 (1913), No. 9, pp. 425-432, pl. 1, figs. 2).—This noctuid is said to be the greatest pest of tobacco in the Philippines, the larvæ attacking growing tobacco, both young and old, but causing the greatest damage to the young leaves. This paper presents an account of its life history and habits with remedial measures.

The cotton worm in Egypt, G. C. DUDGEON (*Bul. Imp. Inst. [So. Kensington]*, 10 (1912), No. 4, pp. 584-620, pl. 1, fig. 1).—A summarized account of *Prodenia litura* (*litoralis*) including its synonymy, distribution, life history, control, etc.

Recent work on the polyhedral body disease of caterpillars, K. ESCHERICH (*Naturw. Ztschr. Forst u. Landw.*, 11 (1913), No. 2, pp. 86-97, fig. 1).—This is a critical review of recent literature on the wilt disease of caterpillars.

The rice caterpillar (*Laphygma frugiperda*), G. E. BODKIN (*Jour. Bd. Agr. Brit. Guiana*, 6 (1913), No. 4, pp. 172-183).—In British Guiana the fall army worm is an extraordinarily destructive pest, occurring in countless numbers in the young rice nurseries when the plant is at the most critical stage of its growth. If control measures are not immediately taken it destroys the entire nursery in a short time. In this paper the author deals with its distribution, life history, natural enemies, and means of control.

A serious Philippine orange moth (*Prays citri*), E. O. ESSIG (*Mo. Bul. Com. Hort. Cal.*, 2 (1913), No. 11, pp. 722, 723, fig. 1).—The larvæ of this pest is said to live just beneath the rind next to but not in the pulp of the cajel, a variety of the native orange, and to produce gall-like swellings which remain opened at the outside but do not seem to penetrate the pulp at all.

A pest of oranges (*Agr. News [Barbados]*, 12 (1913), No. 302, p. 378).—A small moth, apparently a tortricid, is reported to have become a pest of oranges in Dominica through penetrating the skin and living and feeding in the pulp.

The gunworm of the grape (*Sciopteron regale*), F. MASKEW (*Mo. Bul. Com. Hort. Cal.*, 2 (1913), No. 10, pp. 677-679, figs. 2).—This paper presents descriptions of the stages of a lepidopteran reared from grape twigs collected in the Orient and intercepted at quarantine.

The transmission of verruga by *Phlebotomus*, C. H. T. TOWNSEND (*Jour. Amer. Med. Assoc.*, 61 (1913), No. 19, pp. 1717, 1718).—The author reports the results of a preliminary transmission experiment in which 2 hairless dogs of the species *Canis carabicus* were used. One cc. of serum containing the triturated bodies of 20 females of *Phlebotomus verrucarum*, a biting gnat occurring in

the verruga zones of the Peruvian Andes, was injected in the right shoulder of one of the dogs, the other dog being reserved as a check. The symptoms resulting showed the disease to have been transmitted to the injected dog, while the check animal showed nothing abnormal.

This is said to be the first experimental demonstration of insect transmission of the disease.

The gall midge fauna of New England, E. P. FELT (*Psyche*, 20 (1913), No. 5, pp. 133-147).—Of some 900 species of gall midges known from America, the author lists 137 as occurring in the New England States.

The box cecidomyiid (*Monarthropalpus buxi*), J. CHAINE (*Ann. Sci. Nat. Zool.*, 9. ser., 17 (1913), No. 5-6, pp. 269-359, pls. 3, figs. 26).—This paper relates to the morphology, biology, injury, and remedial measures for this cecidomyiid, which burrows in the leaves of the box (*Buxus sempervirens*).

The life history of *Thrypticus mühlenbergiæ* n. sp., O. A. JOHANSEN and C. R. CROSBY (*Psyche*, 20 (1913), No. 5, pp. 164-166, fig. 1).—The larva of this dipteran lives in the stems of *Muhlenbergia sylvatica* in the vicinity of Ithaca, N. Y.

The biology of *Tabanus striatus*, the horsefly of the Philippines, M. B. MITZMAIN (*Philippine Jour. Sci., Sect. B*, 8 (1913), No. 3, pp. 197-221, pls. 7).—"The eggs of *T. striatus* have been found in masses of from 270 to 425, laid mainly on particles of wood. The incubation period has been determined to be from 3 to 5 days. The behavior of the larva indicates that it is essentially an aquatic form. The insect in this stage has been found to be extremely cannibalistic. In some instances as high as 85 per cent of the brood has been destroyed by this means. They apparently prefer their kind to any other food; at least there is no diminution of the practice even when an abundance of other food is present. There is shown to be a marked diversity in the development of larvæ of the same age. The larval period covers 6 weeks or longer.

"In the ecdyses of *T. striatus* there are 3 distinct molts; the final one, coming a considerable time after the larva is full grown, results in the unveiling of the puparium. The puparium is formed beneath the molting skin of the full-grown larva. This stage lasts from 3 to 7 days, with an average of 5½ days, in the male; and from 4 to 9 days, with an average of 6 days, in the female. In this period the male can be distinguished by the arrangement of the short spines anterior to the terminal teeth of the abdomen. These form a continuous serrated border of from 10 to 12 short spines. In the female these spines occur in 2 groups of from 4 to 6 each. Evidence of development of the adult fly is had in the changes of coloration visible through the puparium. . . . In from 14 to 20 minutes after emergence the imago takes flight. . . .

"All of the draft animals of the Philippines serve as hosts for *T. striatus*. The carabao appears to be the host of choice. The rain trees of this locality serve to harbor great numbers of resting horseflies. In considering methods of eradication, this fact should be considered."

The mechanical transmission of surra by *Tabanus striatus*, M. B. MITZMAIN (*Philippine Jour. Sci., Sect. B*, 8 (1913), No. 3, pp. 223-229; *Philippine Bur. Agr. Bul.* 28 1913, pp. 11).—"T. *striatus* for the first time recorded has been found to play a rôle in the transmission of surra. Bred horseflies have been employed for the first time in such experiments. Errors resulting from naturally infected wild flies have thus been eliminated. Three experiments were successful in the direct or mechanical transmission by 'interrupted' feeding when only a short interval was allowed between the bites on infected and healthy animals. In 16 experiments the minimum number of flies with which the infection could be transmitted was 2.

"Trypanosomes of surra were not found to be transmitted hereditarily in *T. striatus* Fabricius. The contaminated labellum of the fly does not appear to be a factor in the conveyance of infection. The maximum length of time that *Trypanosoma evansi* has been demonstrated microscopically in the gut of this species of fly after feeding on infected blood is 30 hours; the organisms were found in the fly's dejecta 2½ hours after biting the infected animal; and suspensions of flies, when injected subcutaneously, were found infective for animals for a period of 10 hours after the flies had fed on infected blood."

Stages in life history of warbles, C. VANEY (*Abs. in Jour. Roy. Micros. Soc. [London], 1913, No. 5, p. 480*).—The author distinguishes 4 larval stages in species of Hypoderma, (1) the boring larva which emerges from the egg, traverses the mucous membrane of the alimentary canal, and lodges in the submucosa; (2) the migratory larva which develops in great part in the submucosa of the gullet, migrates in the connective tissue to the subcutaneous tissue, and finally perforates the dermis; (3) a short third stage, sedentary in the skin, and breathing atmospheric air; and (4) the final stage, which lasts for 3 months and is sedentary until the host is left.

It is concluded that all the facts regarding *H. bovis* confirm the theory of Hinrichsen and Curtice that the parasite enters cattle by the alimentary tract exclusively.

Flies as carriers of *Lamblia* spores.—The contamination of food with human excreta, C. W. STILES and W. S. KEISTER (*Pub. Health Rpts. [U. S.], 28 (1913), No. 48, pp. 2530-2534*).—The authors present evidence to show that the house fly is capable of carrying *Lamblia* spores. "If flies can carry *Lamblia* spores measuring 10 by 7μ, and bacteria that are much smaller, and particles of lime that are much larger, there is no ground to assume that flies may not carry *Entamoeba* and *Trichomonas* spores."

Flies and disease in the British army, S. WESTCOTT (*Jour. State Med., 21 (1913), No. 8, pp. 480-488*).—This general account includes observations made by the author.

Control measures for the olive fly, CHAPELLE (*Bul. Mens. Off. Renseig. Agr. [Paris], 11 (1912), No. 12, pp. 1703-1707*).—This is a summary of the results of observations and experiments by the Oleaculture Service in France during 1912.

The Anthomyidæ, J. SCHNABL and H. DZIEDZICKI (*Abhandl. K. Leopold. Carolin. Deut. Akad. Naturf., 95 (1911), No. 2, pp. 55-358, pls. 35*).—A revision of the family Anthomyidæ taken in its widest sense. Special consideration is given to the male genitalia, the plates consisting of drawings of the hypopygia. Descriptions of a large number of new species are included.

A synopsis of the dipterous groups Agromyzinæ, Milichiinæ, Ochthophilinæ, and Geomyzinæ, A. L. MELANDER (*Jour. N. Y. Ent. Soc., 21 (1913), No. 4, pp. 283-300, pl. 1*).—A continuation of the paper previously noted (*E. S. R., 29, p. 657*).

The importance of the rat flea in determining the distribution of bubonic plague, S. KITASATO (*Berlin. Klin. Wchnschr., 50 (1913), No. 41, pp. 1881-1884; abs. in Jour. Amer. Med. Assoc., 61 (1913), No. 21, p. 1939*).—The author confirms the efficacy of the method of collecting rat fleas by turning guinea pigs loose in the infected buildings. During the course of work at Kobe in 1909-10 guinea pigs collected infected fleas in 11 of 42 houses supposed to have been thoroughly disinfected after cases of plague, thus proving that the disinfection had not been complete. One hundred and twenty-two guinea pigs which were turned loose in 36 other houses from which rats had been exterminated and the buildings made absolutely rat proof collected but one flea and no signs of infection were found.

The western twig borer (*Amphicerus punctipennis*), E. O. ESSIG (*Mo. Bul. Com. Hort. Cal.*, 2 (1913), No. 10, pp. 681-684, figs. 3).—A brief summarized account of this coleopterous borer, which attacks the algaroba (*Prosopis juliflora*), apricot, pear, etc.

Two ladybirds injurious to potato plants, R. W. JACK (*Rhodesia Agr. Jour.*, 11 (1913), No. 1, pp. 77-82, pl. 1).—The author states that two species of *Epilachna* (*E. dregci* and *E. hirta*), which normally feed on certain wild species of solanaceous plants in Southern Rhodesia, have developed a taste for the potato and are a common source of injury.

Psylliodes attenuata, the hop or hemp flea beetle (*Verhandl. K. K. Zool. Bot. Gesell. Wien*, 63 (1913), Nos. 1-2, pp. 1-25, figs. 15; 3-4, pp. 98-136, figs. 20).—This paper consists of 2 parts. The first by F. Tölg deals with the morphology and biology of the immature stages; the second by F. Heikertinger with the imago, including injury and preventive measures.

The Mexican cotton boll weevil (*Anthonomus grandis*), E. W. BERGER (*Univ. Fla., Off. Insp. Nursery Stock, Circ.* 6, 1913, pp. 24, pls. 7, figs. 4).—A general account of the boll weevil, including means of control.

Utilization of entomophagous parasites in combating disease conveying insects, E. BRUMPT (*Abs. in Ann. Méd. Vét.*, 62 (1913), No. 7, pp. 402-410).—In discussing the importance of *Ixodiphagus caucurtei*, a parasite of ticks recently described as new (E. S. R., 27, p. 564), the author states that he has met with considerable success in the experimental infestation of several species of ticks. At Chantilly, Department of Oise, as high as 17 per cent of the nymphs of *Ixodes ricinus* on deer were found to be parasitized by it, and at Fontainebleau under similar conditions as high as 10 per cent. At the latter place two nymphs of *Hæmaphysalis concinna* were also discovered to be parasitized. Experimentally he succeeded in parasitizing 95 per cent of *I. ricinus*, 90 per cent of *Dermacentor reticulatus*, 90 per cent of *Rhipicephalus sanguineus*, and 100 per cent of *D. venustus*.

Notes on the biology of this parasite, of which the author has reared four successive generations in five months, are included.

The life history and habits of *Spalangia muscidarum*, a parasite of the stable fly, H. PINKUS (*Psyche*, 20 (1913), No. 5, pp. 148-158, pl. 1, fig. 1).—It is stated that the adults of this parasite, recently described as new (E. S. R., 29, p. 359), are scavengers from habit, preferring to feed on the remains of the host, and that it is not necessary to furnish prepared food in rearing cages. It is said to be a simple parasite, and does not usually deposit a second time in a single host. In addition to the stable fly, the house fly, horn fly, *Helicobia quadrisetosa*, and *Pseudopyrellia cornicina* have been parasitized experimentally. That the stable fly is the principal host of this parasite appears to be due to its breeding habits. Breeding is said to progress well at 70° F. and somewhat higher temperatures. The adults become inactive at from 55 to 60°.

It is possible to propagate these parasites artificially in large numbers throughout the winter and liberate them early in the spring. By this means the first generation of flies may be cut down to a great extent, and this aids in the control of the flies throughout the year.

A breeding cage, modeled by the author and found to be quite practical for the breeding of this parasite, is described and illustrated.

Descriptions of ten new genera and twenty-three new species of ichneumon flies, H. L. VIERECK (*Proc. U. S. Nat. Mus.*, 44 (1913), pp. 555-568).—Among the more important species described as new are *Apanteles laspeyresia*, reared from *Laspeyresia toreanta* on *Pinus ponderosa* at Shasta, Cal.; *A. phycodis*, a parasite of *Phycodes radiata*, and *A. plusia*, a parasite on *Plusia agamma*, both at

Bangalore, India; *Meteorus laphygmae*, reared from the fall army worm at Brownsville, Tex., and which may prove to be only a race or variety of *M. hyphantriae*; *Perilitus eleodis*, reared from *Eleodus suturalis* at Argonia, Kans.; *A. congregatus*, reared from *Ceratonia catalpæ* at Greenville, S. C.; *A. empretiæ*, reared from (*Empretia*) *Sibine stimulea* at Washington, D. C.; *Opius anastrephæ*, reared from *Anastrepha* sp. at Mayaguez, Porto Rico; *Enicospilus heliothidis*, a parasite of *Heliothis obsoleta*, at Deli, Sumatra; *Mesochorus plusiæphilus*, which is a hyperparasite and probably parasitic on *Apanteles plusiæ* or on a *Meteorus*, at Bangalore, India; *Pezomachus perniciosus*, reared from cocoons of *Meteorus laphygmae* at Brownsville, Tex.; *Phygadeuon epochræ*, a parasite on *Epochra canadensis* at Bozeman, Mont.; etc.

Descriptions of six new genera and twelve new species of ichneumon flies, H. L. VIERECK (*Proc. U. S. Nat. Mus.*, 44 (1913), pp. 639-648).—The new species include two fruit fly parasites from India, namely, *Asobara orientalis* n. sp. and *Diachasmimorpha comperei* n. g. and n. sp.

Another red species of the genus *Oligosita*, J. C. CRAWFORD (*Canad. Ent.*, 45 (1913), No. 9, pp. 311, 312).—A parasite reared from the eggs of *Tomaspis varia* in Trinidad is described as *Oligosita giraulti* n. sp.

The egg parasite of the small sugar-cane borer, G. E. BODKIN (*Jour. Bd. Agr. Brit. Guiana*, 6 (1913), No. 4, pp. 188-198, pls. 4).—A species of *Trichogramma*, closely related to *T. pretiosa* and *Chætosicha nana*, is deemed the most effective of the several parasitic enemies of *Diatræa saccharalis* in British Guiana. In the present paper the author deals with its life history and habits.

As many as 5 parasites may develop in a single egg of the sugar-cane borer, 3 being an average number. The author confirms previous observations, which show that the female *Trichogramma* is capable of producing a parthenogenetic generation, the progeny invariably being males. Eighty adults which developed from 100 ovipositions was the maximum number of parasites produced by a single female.

Introduction to the study of the myriapods, C. E. PORTER (*Introduccion al Estudio de los Miriápodos. Santiago, Chili, 1911, pp. 68, figs. 22*).—This is an illustrated account of the morphology, biology, classification, and economic importance of myriapods. It includes a list of the 64 species described from Chili and a bibliography of the more important literature.

FOODS—HUMAN NUTRITION.

The meat supply of the German Empire—an investigation of the causes and effects of the increased cost of meat and means of overcoming it, J. B. ESSLEN (*Die Fleischversorgung des Deutschen Reiches. Eine Untersuchung der Ursachen und Wirkungen der Fleishteuerung und der Mittel zur Abhilfe. Stuttgart, 1912, pp. 224; rev. in Ztschr. Agrarpolitik, 11 (1913), No. 10, p. 322*).—As the subtitle indicates, this book is a study of the conditions leading to the increased cost of meat in Germany and of means of increasing the supply so that the per capita consumption need not fall below the Voit dietary standard. The reduction of duties on cereals as a means of encouraging home production of meat, and the dependence of Germany on Argentina for meat in case of war, are among the topics discussed.

The price of meat in Paris, P. VINCEY (*Le Prix de la Viande. Paris, 1912, pp. 151, pls. 6, figs. 57*).—This book, privately printed, gives the results of a study of meat prices as shown in the official market reports of the Prefecture of the Seine and of the Police. The three points especially investigated were, the variations in the wholesale and retail prices of meat; the rise in price brought about by the retail sale of meat in small city shops; and the distribution among

producers and intermediaries of the proceeds of the sale of meat products in Paris.

The author estimates that of the price paid by the retail buyer, 76 per cent goes to the original producer, while, of the remaining 24 per cent, 2 per cent goes to the railways, 1 per cent to the cattle commissioners, 5 per cent to the city of Paris (for duties, slaughterhouse fees, market facilities, etc.), 3 per cent to the wholesale dealers, and 13 per cent to the retail dealers.

The appendix includes plates showing the method of cutting meats and the names of cuts in vogue in the Parisian markets.

The red color developed when meat is boiled in water, KLUT (*Mitt. K. Landesanst. Wasserhyg. Berlin-Dahlem*, 1913, No. 17, pp. 36-39; *abs. in Chem. Zentbl.*, 1913, II, No. 13, p. 1162).—The red color was noted in meat cooked in soft to medium hard water flowing from zinc-coated pipes and containing variable quantities of free carbon dioxid and occasionally very small quantities of nitrates.

The experiments showed that the presence of minute quantities of N_2O_3 in the water was sufficient to cause a red color and explained the observed red color in boiled meat as due to the presence of minute quantities of N_2O_3 produced by the reduction of nitrates by zinc in the presence of free carbon dioxid. The author recommends that water which has stood in the pipes for a long time should not be used for cooking purpose but allowed to run for a time before using.

The Tellier method of preserving dried meat, LALLIÉ (*Deut. Schlacht u. Viehhof Ztg.*, 13 (1913), No. 43, pp. 655, 656).—In this summary of an article in *La Nature* a method of preserving meat is described which consists essentially of drying it in vacuum until about 20 per cent of the water is removed, which requires from about 12 to 24 hours. The process is said to be inexpensive, while the nutritive value and culinary quality of the meat are unchanged.

The author states that such partially dried meat keeps well under ordinary conditions.

Seasonings and bouillon cubes, K. MICKO (*Ztschr. Untersuch. Nahr. u. Genussmitl.*, 26 (1913), No. 7, pp. 321-339).—Analytical data are reported and discussed.

The chemical composition of rye and its milling products—the distribution of the materials in the grain, M. P. NEUMANN, H. KALNING, ET AL. (*Ztschr. Gesam. Getreidew.*, 5 (1913), No. 2, pp. 41-50).—Determinations were made of the composition of specially selected typical samples of the whole grain and the various milling products of rye. The proportions of soluble to insoluble protein and of various sugars and pentosans to the total starch, nonnitrogenous extractives, crude fiber, phosphoric acid, etc., found in the different milling products are noted in detail.

The chemical composition of wheat and its milling products—the distribution of the materials in the grain, H. KALNING and A. SCHLEIMER (*Ztschr. Gesam. Getreidew.*, 5 (1913), No. 7, pp. 199-207).—This work is carried out on the same lines as that of Neumann on rye, noted above.

The authors suggest the importance of a more extended knowledge of the various milling products for the sake not only of making technical improvements in the milling processes, but also of a better understanding of nutritive value. The significance of ferments in the grain during both storage and bread making is also indicated.

The bread making qualities of domestic [German] and foreign wheats, M. P. NEUMANN (*Ztschr. Gesam. Getreidew.*, 5 (1913), No. 8, pp. 223-229, figs. 11).—Bread making tests were made to determine the behavior of characteristic mixtures of German and foreign wheats. In general, the addition of the hard foreign wheats increased the bread making qualities of the domestic flour.

Indian edible swallows' nests, H. ZELLER (*Hoppe-Seyler's Ztschr. Physiol. Chem.*, 86 (1918), No. 2, pp. 85-106).—Analytical data are reported, particularly with reference to the nitrogenous constituents present.

Grecian honey and wax, E. I. EMMANOUEL (*Ber. Deut. Pharm. Gesell.*, 23 (1913), No. 6, pp. 395-410; *abs. in Chem. Zentbl.*, 1913, II, No. 14, p. 1249).—This article reports in a more accessible form material previously published in Greek (*E. S. R.*, 28, p. 862). (In this note the author's name was incorrectly spelled.)

The manufacture of chocolate, R. VALLIER (*Rev. Gén. Chim.*, 15 (1912), No. 12, pp. 213-223, *figs.* 8).—This article, which is illustrated with cuts of machinery, deals with the raw materials utilized in the manufacture of chocolate, the usual methods for manufacturing this commodity, the manufacture of soluble cocoa and various other specialties, and the amount of chocolate consumed in various countries. In 1905 the United States consumed the largest quantity of these products.

Modern fruit ethers, E. WALTER (*Pure Products*, 9 (1913), No. 11, pp. 543-549).—The character and uses of fruit ethers are discussed and formulas are given for making "the most commonly used [artificial] fruit ethers."

[Inspection of foods, dairy products, and feeding stuffs], W. D. SAUNDERS ET AL. (*Quart. Rpt. Dairy and Food Comr. Va.*, 1913, June-Aug., pp. 60).—Data regarding the analysis of miscellaneous samples of foods and beverages, inspection work, and other activities are reported.

Extracts from the report of the inspection service, etc., C. H. KETNER (*Chem. Weekbl.*, 10 (1913), No. 37, pp. 806-812).—This article is taken from official reports for the year 1912 regarding the examination of foods and other materials as conducted by the Office of Public Health in Holland. The subjects mentioned include milk, bread, Rangoon beans, lemonade sirups, jams, saccharin, preservatives, distilled liquors, etc.

The adulteration of sugar products as defined by Italian legislation, L. GABELLI (*Ann. R. Accad. Agr. Torino*, 55 (1912), pp. 255-292).—A discussion of Italian laws, municipal regulations, etc., relating to the adulteration of foods made with sugar.

Scientific standards for the governmental regulation of foods, J. R. MURLIN (*Pop. Sci. Mo.*, 83 (1913), No. 4, pp. 344-354).—A plea that the scope of governmental control over food materials be so extended as to make it necessary for all those offered for sale to bear on their labels their energy value and percentage of protein.

What the Department of Agriculture is doing for the housewife, A. D. HOLMES (*Alumni Bul. Univ. Va.*, 3. ser., 6 (1913), No. 4, pp. 546-554).—The activities of the Department which are of interest to the housewife, particularly the nutrition investigations of the Office of Experiment Stations, are discussed in this address, which was delivered before the Rural Life Conference, University of Virginia, July, 1913.

Division of labor between country and city in the production of animal food materials as an aid to the regulation of the cost of living, F. FALKE (*Mitt. Ökonom. Gesell. Sachsen*, 1912-13, pp. 167-197, *figs.* 11).—This address, delivered before the Saxon Society of Economics, February, 1913, gives a description and discussion of the cooperation which has been successfully organized between a rural association of hog breeders and the cities of Ulm and New Ulm (Bavaria).

The breeders' association agreed to furnish a given number of hogs of given average weight at a fixed price. The 2 cities provided land and buildings for a fattening station, made a loan to the association for the feed used in fattening, and regulated the sale of the fattened animals in the

2 cities. The hogs thus supplied furnished about one-seventh of the amount annually consumed and were regularly distributed in different districts by arrangements with the butchers' associations and retailed at a price below the prevailing one. The profits to both dealers and breeders are considered just, though the latter naturally varied with the price of feed.

Retail prices, 1890 to June, 1913, F. C. CROXTON (*U. S. Dept. Labor, Bur. Labor Statis. Bul. 132, 1913, pp. 134*).—This publication, which is No. 10 of the Retail Prices and Cost of Living Series, contains a summary of data regarding retail prices of food in different States in the United States from 1890 to June, 1913.

Data are also given regarding the scaling weight (i. e., weight of dough before baking) as well as the prices of the principal brands of baker's wheat bread as reported by representative bakeries, and some statistics regarding the cost of coal and gas.

[Storage and the housekeeper's problems] (*Proc. Amer. Warehousemen's Assoc., 21 (1911), pp. 160-163, 232-258, pls. 2, figs. 2*).—Among the papers presented at the annual meeting held in Chicago in December, 1911, several are of interest to housekeepers, namely: Cold Storage for Household and Personal Effects, by Aspinwall; Economic Results of Cold Storage, by G. K. Holmes; and Effects of Temperature on Changes in the Flesh of Poultry, by Mary E. Pennington.

Exhibiting, classifying, and judging homemade products, J. B. S. NORTON (*Hyattsville, Md., 1913, pp. 32*).—This pamphlet, which was prepared while the author was in charge of the home products exhibit of the Maryland Horticultural Society, discusses the management of exhibits and related topics, awards, and rules for judging, and gives some directions regarding the preparation of fruit products and a collection of score cards for canned fruits, jellies, preserves, and other fruit products.

The economy administration cook book, edited by SUSIE R. RHODES and GRACE P. HOPKINS (*Hammond, Ind., 1913, pp. 696, pls. 46*).—It has been the purpose, in collecting material for this volume, to include recipes for inexpensive dishes and to present other data which would aid the housewife in economical as well as good living. The recipes have been contributed by a very large number, including many women of prominence. A considerable number are quoted from the Wilson Family Cook Book. Many menus are included, as well as discussions of preparing and preserving food and other topics, such as an expensive and an inexpensive luncheon regarded as equally attractive and palatable and of practically the same nutritive value, by Mrs. T. R. Marshall, home luncheons and lunch box combinations, by Emma S. Jacobs, and a list of articles which should be served with the proper items in a menu.

The twentieth century book for the progressive baker, hotel confectioner, ornamenteer, and ice cream maker, F. L. GIENANDT (*Boston, 1913, 2. ed., pp. 274, pls. 58, figs. 127*).—This volume, which consists largely of recipes and directions for the preparation of food, is designed especially for the use of bakers and professional cooks. The author has summarized his experience in various matters, among others the use of powdered milk, which he has found in general to be satisfactory.

Diet in health and disease, J. FRIEDENWALD and J. RUHEÄH (*Philadelphia and London, 1913, 4. ed., rev. and enl., pp. 857+16*).—The authors state that in preparing this edition (*E. S. R., 17, p. 579*) several new sections have been added, including those dealing with the mechanism of digestion, salt metabolism, duodenal alimentation, and the use of the soy bean, while other sections have been revised, including those on metabolism and the prescribing of diet, infant feeding, and several sections dealing with diet in disease. New tabular

matter and diet lists have been prepared and other changes made. These and other matters are discussed at some length in the preface to this edition.

The child—its care, diet, and common ills, E. M. SILL (*New York, 1913, pp. VIII+207, figs. 34*).—A brief but fairly complete guide in the intelligent care of infants and small children. The 40 or more pages devoted to feeding outline the general principles regarding the diet of children and give definite practical suggestions as to their application. The relation of diet to the more common disorders of childhood is also noted.

The proper diet in the Tropics, with some pertinent remarks on the use of alcohol, A. C. EUSTIS (*Amer. Jour. Trop. Diseases and Prev. Med., 1 (1913), No. 4, pp. 288-293*).—The author holds that there is greater danger from an excessive use of meat in tropical than in temperate regions, because "ptomaines", which may be produced from undigested meat by the action of putrefactive bacteria in the colon, and which under ordinary conditions would be "rendered inert by the liver cells", would not, in his opinion, be so taken care of where there is little severe exercise, as is the case with most residents in warm regions.

He believes further that in such regions "there is little need of internal combustion to maintain the body temperature."

Similar arguments are given against the use of alcohol.

In the author's opinion, not more than 40 gm. of protein per day should be eaten in the Tropics. He believes that the energy value of the daily diet should be from 2,000 to 2,500 calories, depending upon the muscular work done, fats being taken in moderation and the energy supplied largely from carbohydrates; that vegetable proteids are preferable to animal proteids; and that the diet should contain an abundance of fruits and vegetables.

The desirability of limiting the amount of meat in the diet is illustrated by a case cited in which symptoms of toxemia in a patient were overcome by reducing the meat consumption and which the author considers typical of many which he states have come under his observation.

Meat feeding experiments with mice and their value as a means of determining the harmfulness of suspected meat upon the health, R. REINHARDT and E. SEIBOLD (*Ztschr. Infektionskrank. u. Hyg. Haustiere, 12 (1912), No. 4, pp. 332-350*).—The literature relating to feeding experiments with diseased meats is reviewed and the results are given of a series of experiments in which white mice were fed upon meat which had been infected in some instances with *Bacillus paratyphosus* and in others with *B. enteritidis*, the infections having undergone various stages of development.

From the results of these experiments, the authors conclude that white mice are not suitable subjects for such experiments and that neither positive nor negative results of the feeding of suspected meat to white mice will permit the drawing of conclusions relative to the fitness for human food of the meat in question.

Creatin and creatinin in total and partial fasting, V. SCAFFIDI (*Arch. Ital. Biol., 59 (1913), No. 2, pp. 161-172*).—Studies were made of creatin and creatinin and of total nitrogen exchange in feeding laboratory animals (dogs) on a mixed diet, in total fasting, and in a diet in which the nitrogen was replaced by fats.

During fasting a variable quantity of creatin appeared in the urine, while under normal conditions of nitrogen equilibrium little or none was found. The quantity of nitrogen eliminated in these experiments and derived from the combustion of tissue was greater than that eliminated during maintenance upon a mixed diet sufficient to maintain body weight. More creatinin was elimi-

nated than under normal conditions. The percentage of creatinin nitrogen decreased with the increase of total nitrogen; consequently, the elimination of this substance is not proportional to the total nitrogen. If, however, creatin nitrogen be considered as creatinin nitrogen, the total of such nitrogen is nearly that of the normal percentage of creatinin nitrogen.

When the nitrogen of the normal mixed diet is replaced with fat, the organism tends to retain nitrogen which is eliminated in smaller proportions than in mixed feeding or in total fasting. The quantity of creatinin eliminated is also smaller, but the appearance of small quantities of creatin is not prevented. The daily percentages of creatin nitrogen and creatinin nitrogen vary less than in complete fasting. There appears to be a relation between endogenous nitrogen and creatin and creatinin. Therefore, the quantity of creatin eliminated is not proportional to the amount of nitrogen ingested.

Purin metabolism with diminution of the processes of oxidation in the organism, V. SCAFFIDI (*Arch. Ital. Biol.*, 59 (1913), No. 2, pp. 172-179).—The experiments here noted were made with 2 types of laboratory animals, those (dogs) in which the uric acid eliminated is the result of oxidation and those (ducks) in which it is of synthetic origin. In both groups, the animals were previously kept on a purin-free diet and then made to inhale air containing different amounts of carbon dioxide and oxygen.

When the conditions determining a temporary variation in the processes of oxidation had thus been controlled, it was found that they had no influence on the uric acid metabolism of the dogs. In the experiments with ducks, however, temporarily limiting the oxidation of the tissues caused an increased formation of uric acid. This fact is to be explained by assuming either that the slight uricolytic power of the ducks is lessened by the conditions of the experiment or that the synthesis of uric acid is facilitated by the products of the breaking down of the protein molecule.

Purin metabolism during fasting, V. SCAFFIDI (*Arch. Ital. Biol.*, 59 (1913), No. 2, pp. 180-192).—Ducks and dogs were used in these experiments as types of animals in which the uric acid eliminated was formed by synthesis and oxidation, respectively.

In the case of ducks, the author concludes that the uric acid eliminated represents from 42 to 53 per cent of the total nitrogen metabolism. During fasting and overfeeding it follows closely the variations of total nitrogen. The proportion of total to uric nitrogen rose during high feeding and fell during complete fasting.

In the case of dogs, fasting produced only slight modifications in the purin metabolism, the quantity eliminated diminishing without any apparent relation to the total nitrogen.

The problem of intermediary purin metabolism.—I, The storage of purin in the liver and its relation to the excretion of uric acid, H. ROSENBERG (*Ztschr. Expt. Path. u. Ther.*, 14 (1913), No. 2, pp. 245-254, fig. 1).—This article describes experiments made with the surviving livers of dogs and planned to show the effect of atophan on the storage and metabolism of purin bodies in the liver. Its effects in cases of gout, etc., under different dietary conditions are also touched upon.

The problem of intermediary purin metabolism.—II, Concerning uric acid puncture, E. MICHAËLIS (*Ztschr. Expt. Path. u. Ther.*, 14 (1913), No. 2, pp. 255-261, fig. 1).—These experiments were made with rabbits on which the operation known as the Claude Bernard sugar puncture had been performed. The operation increased the allantoin and also the total nitrogen content of the urine notably.

The conclusion is drawn that the center affected controls the purin metabolism as well as that of sugar, and indirectly influences the secretion of nitrogen. Hence, the operation might be correctly designated as uric acid puncture.

The effect of water ingestion on the fatty changes of the liver in fasting rabbits, M. R. SMIRNOW (*Amer. Jour. Physiol.*, 32 (1913), No. 6, pp. 309-314).—This paper, delivered before the Washington meeting of the American Association of Pathologists and Bacteriologists, May, 1913, describes experiments made with fasting rabbits to some of which no water was given. The author summarizes the changes in the livers as follows:

"Fasting, unwatered rabbits, from 4 days and upwards, show a decided fatty infiltration of the liver, apparent in gross and microscopically. Fasting, watered rabbits, from 10 days and upwards, may show similar changes in the liver, but the percentage of incidence is very low as compared with that of the unwatered animals.

"In half the number of fasting, watered rabbits under observation, microscopic vacuolation was observed. This vacuolation may be interpreted as a fatty change, but the picture is by no means comparable to that seen in the nonwatered animals."

The problem of fermentation and putrefaction in the human intestines during the administration of different types of diet as indicated by chemical analysis of the feces, H. FISCHER (*Ztschr. Expt. Path. u. Ther.*, 14 (1913), No. 2, pp. 179-244).—The studies on which this article is based were made with patients suffering from chronic constipation and receiving special diets, viz, a milk diet, vegetable and fruit diet, diet unusually rich in protein, diet unusually rich in fat, and the so-called Schmidt intestinal test diet (a simple mixed semi-invalid diet). The acidity or alkalinity of the feces was determined and also their content of volatile fatty acids, free and total ammonia, neutral fats, sulphuric acid, amino acids, mercaptan, etc., the hope being thus to throw light on the bacteriological conditions of the intestines as the result of the different diets.

Among the more significant points in the author's summary is the fact that the milk diet, the fruit and vegetable diet, and those rich in protein or in fat all yielded feces with noticeably high ammonia content. This indicates that the latter is not due simply to the decomposition of protein in the food, but may be caused, as in the case of the fruit and vegetable diet, by the prolonged retention of cellulose in the intestines and the increased putrefactive changes therein, or, as in the case of the fat diet, by the stimulation of the pancreas and other glands by the higher fatty acids and soaps and the irritation of the intestinal mucus by the lower fatty acids.

Calcium and phosphorus in growth at the end of childhood, HERBST (*Ztschr. Kinderheilk., Orig.*, 7 (1913), No. 3-4, pp. 161-192; *abs. in Zentbl. Expt. Med.*, 4 (1913), No. 10, p. 446).—Of the 2 subjects (14-year old boys) studied one was strong and the other less well developed.

Calcium and phosphorus metabolism were determined during long intervals. With the stronger subject there was a calcium oxid retention of 0.4543 gm. per day, equivalent to 165.8 gm. per year. With the less well developed boy the retention was 0.2172 gm. daily, or 79.3 gm. per year. These values are about the same as those calculated on theoretical assumptions.

Phosphoric acid retention in growth is apparently dependent upon calcium and also upon nitrogen retention.

Calorimetric observations on man, J. S. MACDONALD (*Rpt. Brit. Assoc. Adv. Sci.*, 1912, pp. 286-290).—These experiments were reported by the committee appointed by the British Association for the Advancement of Science to make calorimetric observations on man in health and in febrile conditions. They

were made with the calorimeter previously described (E. S. R., 27, p. 367). The usual temperature readings were made at 5-minute periods.

From these observations "the heat output of the subject (plus any heat arising from a subsequent conversion of mechanical work into heat) was calculated for each 5-minute period and the results platted as curves. By correction from observation these curves, altered by allowances for the storage of heat in the subject, were converted into heat-production curves—that is to say, curves representing the total transformation of energy within the calorimeter." These curves of heat output are "parallel to the surface temperature curves obtained simply by one set of observations during the first half-hour of each 'work experiment,' that is to say, so long as the observations of surface temperature are not complicated by the accumulated presence of surface moisture, and in some of the extremely light 'work experiments' continue in parallel fashion to the end of the experiment whilst showing corresponding variations at nodal points. . . .

"It would thus seem as if the transformation of energy per unit of mechanical work performed was a quantity that increased up to a certain value which was then maintained, and that the 'efficiency' of man as a machine varied in this fashion with the time spent in work. . . .

"If it is not the case, then two other lines of explanation have in addition to be examined. Thus it may be that the 'deep temperature' (rectal) is not a satisfactory criterion of the mean temperature of the human body and does not therefore provide a proper basis for corrections representing its average storage of heat during any short period (5 minutes) of time. It might, on the other hand, be the case that energy liberated during the performance of mechanical work as the outcome of oxidation processes developed as fully at the commencement as at the end of the experiment might be stored within the body, possibly within the musculature, in some form other than heat, as, for example, in the form of electrical energy, and therefore not discoverable by reference to changes of temperature."

In view of these considerations, the data obtained after the first hour were used in estimating the maintained efficiency of the subjects. The total transformation of energy in calories per subject per hour was calculated.

Previous calibration experiments with the cycle ergometer as driven by a special motor furnished the data for estimating the value in calories of the mechanical work performed by the subjects. Comparing the figures for the second and the fifth hours, an increment of work performance of 29.5 calories per hour was found in the subjects, the increment of increase in their total energy transformation for the same period being 119, 121, and 120 calories, respectively.

"It is clear, in the first place, that the 'efficiency' of these 3 different persons of different ages (45, 24, 36) and of quite different physical appearance and habits is almost the same, and in the second place that it is at least . . . of the magnitude of 24.6 per cent."

The energy produced by the processes of oxidation in the organism; physiology of muscular work, R. HÖBER (*Ztschr. Elektrochem.*, 19 (1913), No. 19, pp. 738-746).—This paper, delivered at the meeting of the Bunsen Society of Applied Physical Chemistry, Breslau, August, 1913, is a summary of the advance made in the knowledge of the chemo-dynamics of muscle from the time of Fick to the present.

According to the author, a muscle is to be regarded as a chemodynamical and not a thermodynamical machine, since it has so high an effectiveness that one would have to take into account extremely high temperatures if a thermodynamical explanation were offered.

The chief work reaction which causes contraction depends upon the formation of lactic acid. As yet the origin of the lactic acid is not known. Probably it does not come directly from glycogen or from dextrose. When muscle is stimulated and fatigued, the lactic acid disappears, oxygen being taken up and carbon dioxid given off, not, however, by means of simple combustion but through the regeneration of the lactic-acid-yielding substances coupled with an oxidative process. Muscular contraction is apparently brought about by a swelling which is itself brought about by the presence of the acid. The laws of the increased volume phenomena are the same as those for the dilution of concentrated solutions. In this case, as in the case of the muscle, practically all the energy changes can be noted as work.

A discussion follows the paper.

The influence of the temperature of the surrounding air upon carbon dioxid excretion in man—a contribution to the subject of heat regulation, L. SJÖSTRÖM (*Skand. Arch. Physiol.*, 30 (1913), No. 1-3, pp. 1-72, figs. 13).—Extended investigations are reported which led to the following conclusions:

Variations in the carbon dioxid excretion of a fasting man at rest, though not absolutely without muscular movement, are not influenced by surrounding temperature, so long as shivering is absent. Shivering causes an increase in the oxidation processes of the body for the purpose of maintaining constant body temperature, the increase being proportional to the intensity of such movement. The increased heat production caused by such means is not sufficient to maintain constant temperature in the body when heat is withdrawn in large quantities. Shivering is probably brought about, too, by nervous reaction in which the temperature condition of the skin plays a part. Whether or not higher temperatures than the surrounding air, 30 to 31° C., caused changes in the intensity of metabolism could not be determined from the experimental data reported. The author is of the opinion that possibly individual peculiarities had an effect upon this.

The influence of body position upon respiration in man, G. LILJESTRAND and G. WOLLIN (*Skand. Arch. Physiol.*, 30 (1913), No. 1-3, pp. 199-228, figs. 3).—According to the conclusions drawn by the authors from their investigations, respiration is influenced in a typical way by the body position, even in a condition of muscular rest and fasting.

Both the frequency and the volume per minute are greatest when standing, less when sitting, and still less when lying down. The number of respirations per minute was lower when lying upon the stomach than when lying upon the back. The changes in ventilation are in large measure directly dependent upon the change in frequency of respiration. The changes in frequency and in ventilation when frequency was constant for different body positions were not caused by variations in carbon dioxid production.

ANIMAL PRODUCTION.

Problems of genetics, W. BATESON (*New Haven, Conn., and London, 1913, pp. IX+258, pls. 3, figs. 11*).—The chapters included in this volume are as follows: The problem of species and variety; meristic phenomena; segmentation; the classification of variation and the nature of substantive variation; the mutation theory; variation and locality; local differentiation; climatic varieties; the effects of changed conditions; the causes of genetic variation; and the sterility of hybrids.

Experimental studies of the inheritance of color in mice, C. C. LITTLE (*Carnegie Inst. Washington Pub. 179, 1913, pp. 11-102, pls. 5*).—The conclusions of

the author of this treatise, which is divided into 2 parts, are based on personal observations made on more than 10,500 mice, the experiments dating from November, 1907, to May, 1912.

Part 1 (pp. 11-46) is a consideration of the factors producing color in mice. These are classified as formative and distributive color factors. The 3 general pigment-producing regions in mice were found to be the eye, the skin, and the hair, the pigments produced being limited to yellow, brown, and black. Color is attributed to the formation of melanin pigment, the product of an oxidation process. It is explained that "the presence of certain distributive factors, or modifications of them, determines what color varieties of mice shall be formed. These distributive factors determine either the total amount of pigmentation or the relative amounts of yellow, brown, and black that are visible."

Relative to the inheritance of spotting the author states that "experimental evidence does not support a theory which postulates the common origin of white produced by spotting and that produced by albinism." It is further explained that "present knowledge of spotted forms is too scanty to decide whether spotting is due to a process of loss of the factor for uniformity of pigmentation, or to a hypostatic restrictive factor. It seems, however, that such spotting as one encounters in guinea pigs, hooded rats, and in many mice, is a unit character subject to enormous quantitative fluctuation, and that it may be considered due to a modification of the factor *Y* or *U* which is hypostatic to unmodified or 'self' forms."

The observation of Morgan that "in crosses between self and spotted forms, in mice, the spotting seemed modified or contaminated by the cross," was corroborated. In crosses with Japanese waltzing mice, "the spotted individuals of F_2 have been contaminated by the cross, having their dorsal pigmentation increased on the average more than 50 per cent over the average of the pure Japanese race." Relative to "whether the various characters are completely independent of each other or whether coupling or gametic association of any sort exists between some of them," it was observed that experiments show no sign of association in the gametes between the several factors or between the 4 conditions characteristic of their absence.

Part 2 of this treatise (pp. 47-102) treats in detail of the experimental data obtained.

Heredity of tricolor in guinea pigs, H. D. GOODALE and T. H. MORGAN (*Amer. Nat.*, 47 (1913), No. 558, pp. 321-348, figs. 145).—Investigations carried on by the authors since 1908 to determine how the different types of tricolor in guinea pigs behave when mated to each other are reported.

With regard to the question of the heredity of black and white somatic areas, it is concluded that such an area or spot is "a center from which color, if present, is more likely to spread, and, if we assume somatic segregation in an early stage of the embryo the extent of the spot will be a measure of the extent to which a given cell containing the color factor multiplies as compared with neighboring areas that have the white factor. In pigeons the dark wing-bar of some breeds may be white in other breeds, although pigment is present elsewhere. We can not assume, of course, a pigment producer to be absent from the germ. It seems more probable that there are special color producers, which if present in the germ, and therefore in all the body cells, give a definite reaction in that region where a white band is formed. In this case there is no localization factor inherent as such, i. e., there is no need to assume somatic segregation, but only germinal segregation of a particular special factor that is realized in a special part. The substitution of a white area for a colored one in guinea pigs might

be looked at in the same way; but the extent to which the spot develops is a more difficult, and perhaps, a different problem."

Reversion in guinea pigs and its explanation, W. E. CASTLE (*Carnegie Inst. Washington Pub.* 179, 1913, pp. 1-10).—The author summarizes the results of his investigation as follows:

"The agouti coat characteristic of wild cavies and of most other wild rodents is dependent upon the presence in the fur of black pigment disposed in a definite pattern with red (or yellow). The factors which control, respectively, the development of black pigment and the production of the agouti pattern are independent of each other. The agouti coat is obtained only when both these factors are possessed by an individual. Only such agouti individuals as are homozygous in both factors breed true under all circumstances."

"An agouti animal which is homozygous in A (the agouti factor), but heterozygous in B (black pigmentation), may produce agouti young and red ones, but not black. An agouti animal which is homozygous in B, but heterozygous in A, may produce agouti young and black ones, but not red. An agouti animal heterozygous in both A and B may produce 3 sorts of young, agouti, red, and black. All F₁ (reversionary) agoutis produced by crossing black with red are of this sort. Agoutis of the other 3 sorts are obtained only in the second or later generations of agouti young."

Reciprocal crosses between Reeves pheasant and the common ring-neck pheasant producing unlike hybrids, J. C. PHILLIPS (*Amer. Nat.*, 47 (1913), No. 563, pp. 701-704, fig. 1).—It is shown that, unlike the case of many birds (fowls, pigeons, canaries, and doves) which give evidence of sex-linked characters, the pheasant hybrid shows "merely a different appearance of male sexual plumage character in the F₁ hybrids of a reciprocal cross between Reeves pheasant and the common ring-neck pheasant." This phenomenon evidently does not occur in the reciprocal crosses of other species of pheasants. No explanation is offered for the present case.

Some points of genetic interest in regeneration of the testis after experimental orchectomy in birds, C. J. BOND (*Jour. Genetics*, 3 (1913), No. 2, pp. 131-139, pls. 2, figs. 5).—In investigations of the results of unilateral oophorectomy in rabbits, the writer observed that "the removal of one ovary in the female rabbit is followed by a compensatory overgrowth in the remaining ovary, and further that this hypertrophy affects both the Graafian follicles or ova-bearing cells and the internal secretion-forming cells." It was found that in birds "the same process occurs in the remaining testis after unilateral orchectomy."

It was further observed "in both male fowls and pigeons that when one or both testes were removed intracapsularly—that is to say, when the testicular substance had been apparently wholly removed and the capsule alone left, a regeneration of the secreting tissue of the testis and the tubuli seminiferi took place within the capsule so evacuated. . . . This regeneration must take place either from the capsule, or more probably from microscopic fragments of secreting tissue which are left adhering to the capsule at the time of the operation." The testis of the domestic fowl apparently has greater powers of structural and functional regeneration after partial removal than exists in mammals.

With regard to "whether the gametes which are formed in this tissue resemble, in their hereditary characters, the gametes which are formed by the original gland before removal," the author's investigation seems to indicate "that the cell divisions of the motor sperm cells which provide the new spermatozoa formed during regeneration of the testis do not take place in exactly

the same order, or are not exactly of the same kind as those which form the sperm cells before removal of the sex gland."

It is suggested that further experiments should be made to confirm these conclusions and to determine other relations existing in the reproductive system of the fowl.

The segregation of fecundity factors in *Drosophila*, E. N. WENTWORTH (*Jour. Genetics*, 3 (1913), No. 2, pp. 113-120).—With a view to studying the effects of inbreeding upon fecundity and general vigor, the author conducted breeding experiments with flies. Four lines of breeding were started. "The largest and most vigorous males were mated with the largest and most vigorous females, the rather weak and small flies were mated together, and 2 lines of medium type, 1 based on size and the other on apparent vigor were also established."

After 9 generations, the breeding record of line 1 (a line lacking in vigor and high fecundity) presented a mean of 29.5 and a standard of variation of 7.31; line 2 (strongly vigorous), mean 135.86 and standard deviation 18.3; and line 3 (medium in size) and line 4 (medium in vigor), mean 72.06 and standard deviation 37.1618. From this the author concludes that "a segregation of fecundity factors is clearly evidenced and the supposed weaknesses from inbreeding are shown up in their true light as the mere segregation of factors for lower vigor."

It was further observed that "the male, whether he come from high or low lines, apparently in nowise influences the eggs laid by the female with whom he pairs, though marked differences, apparently due to segregation, may occur among his female descendants." The reciprocal crossing of strains high and low in fecundity, instead of resulting in 3 single groups, which might have been expected from previous calculations, showed at least 7. No evidence of sex linkage of fecundity factors appeared.

Determination of sex, E. TANSKY (*Hoard's Dairyman*, 46 (1913), No. 15, pp. 420, 421).—After an investigation of the 3-year records of over 600 head of cattle, to determine the percentage of males and females born by months, the author concludes that the month of birth favors no special sex.

Chemical composition of Roumanian and Russian sunflower seed cake, M. GÓRSKI (*Ztschr. Landw. Versuchsw. Österr.*, 16 (1913), No. 3, pp. 141-145).—Comparative analyses were made at the experiment station at Dublany, near Lemberg, of 2 varieties of sunflower seed cake, as follows: Roumanian cake, protein 27, fat 12.51, nitrogen-free extract 21.14, crude fiber 24.39, and ash 5.64 per cent; Russian cake, protein 33.01, fat 11.33, nitrogen-free extract 22.59, crude fiber 18.21, and ash 6.21 per cent.

On Perilla cake and Mowrah meal, F. HONCAMP, M. REICH, and H. ZIMMERMAN (*Landw. Vers. Stat.*, 78 (1912), No. 5-6, pp. 321-347, pls. 4).—Analyses of Perilla cake are reported as water 12.3, protein 36.31, fat 7.05, nitrogen-free extract 19.74, crude fiber 16.28, and ash 8.32 per cent. In sheep-feeding experiments for a period of 10 days, in which meadow hay and Perilla cake were fed and complete digestibility tests made, it was estimated that the digestible nutrients in Perilla cake were protein 36.02, fat 7.05, nitrogen-free extract 10.96, and crude fiber 1.3 per cent.

Analyses were also made of 3 grades of Mowrah meal, one of them showing the following composition: Water 14, protein 17.12, fat 2.17, nitrogen-free extract 53.55, crude fiber 5.62, and ash 7.54 per cent. Mowrah meal is used as a filler in feeds for domestic animals, especially molasses feeds and similar products. The presence of saponin in Mowrah meal and its resulting toxic effect upon animals being fed the meal is noted.

[Results of the examination of stock feeds], W. D. SAUNDERS (*Ann. Rpt. Dairy and Food Comr. Va.*, 4 (1911-12), pp. 67-99).—Results are given of the examination of stock feeds, misbranded, adulterated, or otherwise illegal.

Feeding stuffs (*Ber. Grossh. Bad. Landw. Vers. Anst. Augustenb.*, 1912, pp. 18-35).—Analyses are given of the pressed cake and meal of the following materials: Peanut, coconut, linseed, corn, poppy seed, palm nut, rape seed, sesame, soy bean, and sunflower seed.

Fresh meat supply of western Norway, R. M. RASMUSEN (*Daily Cons. and Trade Rpts. [U. S.]*, 16 (1913), No. 273, p. 958).—It is reported that the market for fresh meat is growing rapidly, owing to the industrial expansion, and that due to the high prices prevalent for the past few years stock raising is being revived. The natural conditions about Bergen are deemed unexcelled for stock raising, especially sheep.

Annual meeting of the Cattle Raisers' Association of Texas (*Cattle Raisers Assoc. Tex. Proc.*, 37 (1913), pp. 169).—A compilation of addresses and discussions relating to the cattle industry of Texas, and including the by-laws, rules and regulations, and list of members of the Cattle Raisers' Association of Texas.

A comparison of the observed and computed heat production of cattle, H. P. ARMSBY (*Jour. Amer. Chem. Soc.*, 35 (1913), No. 11, pp. 1794-1800).—Calorimetric investigations were made upon herbivorous animals, and in particular upon ruminants, to determine the difference between the actual and computed heat production. Previous experiments with carnivora and man had shown a close agreement, but it was thought that the physiological differences in the digestive operations of the ruminant might introduce factors tending to alter these calculations. Observations made during 8 years, 1902 to 1909, inclusive, embracing 57 experiments covering 48 hours each, are reported.

The results of these investigations show an average difference in the observed and computed heat production of cattle of +0.4 per cent, which corresponds very closely to results of previous investigations. It is concluded that "the same equivalencies between chemical energy, heat energy, and mechanical energy obtain in the bodies of herbivorous animals as in those of carnivora or of man, and, as a rule, elsewhere in nature."

Studies of the endogenous metabolism of the pig as modified by various factors, E. V. MCCOLLUM and D. R. HOAGLAND (*Jour. Biol. Chem.*, 16 (1913), No. 2, pp. 299-325).—This article is discussed under 3 headings, as follows:

I. *The effects of acid and basic salts, and of free mineral acids on the endogenous metabolism* (pp. 299-315).—In these experiments young pigs were brought to their lowest level of nitrogen elimination through several weeks of starch feeding. Daily analyses were made of samples of urine for the total creatinin, creatin, ammonia, and urea nitrogen. The author's conclusions are summarized as follows: "The endogenous metabolism of the pig reaches its lowest level when the animal has an abundant supply of carbohydrates together with a salt mixture of an alkaline character. The total output of nitrogen derived from endogenous sources can be greatly increased without changing the output of creatinin. The additional nitrogen which is eliminated on an acid over what appears on an alkaline diet is in the form of ammonia. The animal is not able to use the nitrogen of the urea fraction to neutralize the acids present in the diet, but draws additional nitrogen from the tissues for ammonia production."

II. *The influence of fat feeding on endogenous nitrogen metabolism* (pp. 317-320).—"Feeding fat as the sole source of energy does not lead to a sustained rise in the nitrogen output of pigs which have been reduced to their

lowest possible level of nitrogen metabolism by long continued starch feeding. Fat feeding may produce a considerable elimination of creatin. The total creatinin (creatinin+creatin) may be greatly increased without a corresponding rise in the total nitrogen output. The possibility of the acid or basic character of the ration having an influence on the creatin production is suggested."

III. *The influence of benzoic acid on the endogenous nitrogen metabolism* (pp. 321-325).—"A considerable amount of the nitrogen which appears in the form of urea in pigs reduced to the endogenous level of protein metabolism may be converted into glycocholl when benzoic acid is fed for the purpose of hippuric acid synthesis. When the quantity of benzoic acid ingested is not excessive, there is no noticeable rise in the total nitrogen excreted over that which is eliminated on the same diet without benzoic acid.

"When the quantity of benzoic acid ingested is very large, there is a marked increase in the output of total nitrogen catabolized. The urea nitrogen can not be reduced to a lower level than about 20 per cent of the total. No change in the creatinin output is observed when the protein catabolism is stimulated by excessive doses of benzoic acid. Endogenous protein metabolism appears to consist of at least 2 types. One can be stimulated greatly for ammonia production by the introduction of mineral acids, or for hippuric acid when benzoic acid is introduced; the other, measured by creatinin, remains unaffected by the methods we have described."

Value of potatoes as the basal feed for swine, F. LEHMANN (*Jour. Landw.*, 61 (1913), No. 3, pp. 361-397, pls. 2).—Four lots of 12 weeks' old pigs weighing approximately 20 kg. each were fed during a period of 22 weeks a basal ration of gram feed, fish meal, and chalk. In addition, lot 1 received during the period approximately 171 kg. of corn; lot 2, 671 kg. potatoes; lot 3, 717 kg. potatoes and 4.78 kg. rye chaff fed during the first 8 weeks of the experiment; and lot 4, 63 kg. potatoes, 36.5 kg. rye chaff, and 8.8 kg. meat meal, the meat meal being fed during the last 14 weeks of feeding.

The average daily gain per pig of lot 1 was 0.552 kg. (1.2 lbs.), with a total net profit at the close of the experiment of 10.68 marks (\$2.54); lot 2, 0.496 kg., net profit 6.91 marks; lot 3, 0.553 kg., net profit 14.11 marks; and lot 4, 0.553 kg., net profit 14.84 marks. From this it is concluded that a basal ration of potatoes supplemented with prepared feeds and balanced with a protein feed as meat meal is profitable.

The electro-cardiogram of the horse, J. NÖRRE (*Ztschr. Biol.*, 61 (1913), No. 4-5, pp. 197-229, pl. 1, figs. 45).—This is a description of a specially prepared apparatus which when in contact with various parts of the body of the horse registers graphically the comparative duration and intensity of the heart's movements. There are included charts showing the heart action of the horse as determined by a number of trials.

On the variations in the growth of the exterior of the grade horse of East Prussia, W. VÖLTZ (*Landw. Jahrb.*, 44 (1913), No. 3, pp. 409-436, pl. 1, figs. 2).—Measurements and comparisons were made of the various bones of the limbs, head, breast, back, and general exterior of foals at one-half, 1½, and 2½ years of age, and the relative growth during these ages determined. Complete tabular data are given showing the measurements and percentages of growth at these ages.

Heredity studies in the royal stud at Trakehnen, B. SCHMIDT (*Arb. Deut. Gesell. Züchtungsk.*, 1913, No. 16, pp. X+363+XVI, pls. 22).—Parts 1 and 2 of this volume treat in detail of the improvement of some of the permanent Trakehnen stud strains by various methods of inbreeding. Part 3 deals with

the problem of the heredity of color, with a discussion of the Bunsow, Struwe, Crampe, and Walther theories on color inheritance and of the relation of these to the principles of Mendelian inheritance. Part 4 treats of hereditary diseases, including periodic ophthalmia, cribbing, roaring, and foal lameness.

The author's observations led to the conclusion that a pathologic fold of the eyelids is hereditary, especially in the maternal line. Periodic ophthalmia was found to be hereditary in some cases, and not in others. Roaring was proved to be hereditary. Spavin, navicular disease, and broken windedness were not transmitted; however, it is thought that the first 2 diseases can be transmitted by animals that are much affected by them.

Breeding and raising horses for the United States Army, M. F. DE BARNEVILLE (*Jour. U. S. Cavalry Assoc.*, 24 (1913), No. 99, pp. 411-415).—A general account of the horse-breeding and training operations in use at the Front Royal Remount Depot, Va., and at other remount depots.

How to buy a horse, C. W. GAY and D. S. MILLER (*Penn. Live Stock Sanit. Bd. Circ.* 24, pp. 9).—This circular briefly treats of the general principles to be observed in selecting and buying a horse.

The Shetland pony, C. and ANNE DOUGLAS (*Edinburgh and London*, 1913, pp. XI+176, pls. 25).—A very complete volume treating of the early history of the Shetland pony, present day types, and the care and management of this breed. There is appended a detailed account, by J. C. Ewart, of the physiological changes incident to the origin and development of ponies in general and this breed in particular.

The Grevy zebra as a domestic animal, G. M. ROMMEL (*Amer. Breeders Mag.*, 4 (1913), No. 3, pp. 129-139, figs. 5).—This is an account of the attempts to cross the Grevy zebra on the common mare. In one case there was a marked aversion on the part of the zebra, although no difficulty was experienced in mating with a jennet. In another case there was less antipathy on the part of the male zebra, but no mating resulted. Finally a number of mares were artificially bred, with one live foal resulting.

It was found that zebra semen does not contain relatively so many spermatozoa as does that of the stallion, and this is thought to account in part for the difficulty encountered in breeding by artificial means. It is noted that the ass hybrids have no value as work animals, being decidedly donkey-like in disposition and habits. The mare hybrid is more like a horse in appearance and manners.

The author calls attention to the fact that the Grevy zebra is characterized by its extreme quality or finish, which, if imparted in mule production would offset any coarseness in the mares. It is susceptible to domestication and it is thought that the size may be increased by feed and selection. With regard to the effect of so-called telegony, or the influence of prior impregnation, it was found that the mare which produced the zebra hybrid and afterwards was bred to a Morgan stallion, produced a foal showing no evidences of the zebra impregnation.

Contrary to the usual manner of ass-mare hybrids, the zebra-ass hybrids, both male and female, show sexual activity. They have been bred together, but without results. Evidently the relationship between the zebra and common ass is closer than that between the ass and horse. It is thought that the Grevy zebra would prove of value as a farm animal, if properly handled.

The call of the hen, or the science of the selection and breeding of poultry, W. HOGAN (*Petaluma, Cal.*, 1913, pp. 126, figs. 56).—The author outlines a method for ascertaining the value of a hen by the relative thickness of and distance apart of the pelvic bones. Tests for the determination of capacity, condition, stamina, prepotency, and laying ability are described.

The Campine history, B. A. GATES (*Franklinville, N. Y., 1913, pp. 46, figs. 19*).—This publication deals with the origin, distribution, development, feeding, care, management, and utility value of this breed of chickens.

[Second international egg-laying contest], J. O. HOWE (*Amer. Cult., 75 (1913), No. 46, p. 11, figs. 2*).—In this contest, held at the Connecticut Agricultural College, a White Leghorn broke the international record for egg production in a year by laying 282 eggs. The best pen of 5 laid 1,190 eggs.

Preservation of eggs by refrigeration in sterile air, M. F. LESCARDE (*Refrigerating World, 46 (1913), No. 5, p. 45*).—This is a description of an egg-preserving method whereby eggs are subjected to a mixture of carbon dioxide and nitrogen in an autoclave, and the cases of eggs taken out, hermetically sealed, and stored in cold storage rooms at a temperature varying between 33.8 and 35.6° F. By this method it is claimed that the waste of eggs is eliminated, the eggs retain a "fresh" flavor and their full weight, and remain in good condition longer after removal from cold storage. The cost of treatment and preservation, including all depreciation, is estimated to be 3.44 cts. per dozen.

German oyster culture, T. J. ALBERT (*Daily Cons. and Trade Rpts. [U. S.], 16 (1913), No. 178, p. 637*).—An account of a German oyster fishery comprising about 5,000 acres. It is stated that by careful cultivation it has been possible to produce oysters equal in flavor to any foreign variety. The methods of culture, feeding, and production for market purposes are explained.

DAIRY FARMING—DAIRYING.

Modern dairy guide to greater profits, M. H. MEYER (*Madison, Wis., 1913, pp. 88, figs. 10*).—A general treatise on modern dairy and creamery practice.

Dairying and butter making on small farms, M. A. O'CALLAGHAN (*Dept. Agr. N. S. Wales, Farmers' Bul. 65, pp. 13, figs. 3*).—This publication gives general instructions on the selection of dairy cattle, and on the feed, care, and management of dairy animals. The health of the herd is considered, together with methods of caring for milk and cream and farm butter making.

Correlation between form and function in the dairy cow, H. M. KROON and C. J. RAB (*Tijdschr. Veeartsenijk., 38 (1911), No. 21, pp. 789-822*).—Comparisons were made of the milk and milk-fat records of 100 Holstein cows in an effort to determine the correlation between these records and the body characteristics of the animals. The cows were grouped into 10 classes, according to milk yield (2,000 to 7,000 kg.) and milk-fat record (80 to 240 kg.), with a resulting classification giving the number of cows in each class as follows: As to milk yield, 5, 5, 16, 17, 22, 22, 8, 3, 1, 1; as to butter-fat yield, 9, 15, 17, 17, 23, 12, 5, 1, 1, 0. A close correlation between the milk yield and butter-fat record is thus noted.

Comparisons were then made of the body form and the number of animals of all classes for both milk and fat yield found under each body characteristic. In this case also the number of animals of each class for both milk and fat yield corresponded very closely. The body characteristics noted were length of head, breadth of forehead, shape of poll, thickness of horn at base, color and quality of horn, length of horn, quality of ear, hair growth on the head and poll, size of nose and mouth, color of nostril, and other similar points usually indicative of productive capacity.

There is appended a bibliography of 27 titles.

Red Polls for dairying, S. S. CAMERON (*Jour. Dept. Agr. Victoria, 11 (1913), No. 9, pp. 564-569, figs. 7*).—In this article the author reviews the successful work of the station herd of Red Poll cattle during 3 seasons. Milk-fat tests

ranged from 3.8 per cent to over 8 per cent, the average being approximately 4.5 per cent. The average milk-fat production per cow for each of the 3 seasons was, 255.77, 304.6, and 236.49 lbs., respectively.

It is stated that the crossing of these Red Poll cattle on native grade material produces the polled characteristics and an improvement in dairy qualities.

The new champion cow (*Milk Dealer*, 3 (1913), No. 1, p. 7).—An account of the Jersey cow, Eminent Bess, which now holds the world's record for performance for that breed, with a year's production of over 18,732 lbs. of milk and 963 lbs. milk fat. The record was made under the supervision of the Michigan Experiment Station.

Experiments with the milking machine, N. O. HOFMAN-BANG ET AL. (*Ber. K. Vet. og Landbohøjskoles Lab. Landøkonom. Forsøg* [Copenhagen], 81 (1913), pp. 43, figs. 5).—It was demonstrated that the use of the milking machine was entirely practicable, and except in the case of cows with sore or cracked teats, or poorly placed teats, the results obtained were practically equal to hand milking. The machine milking did not appear to have any influence on the fat content of the milk.

The report also describes trials with a milk cooler conducted during the year 1912-13.

Action of a pituitary solution as the active principle in milk secretion, B. A. HOUSSAY, L. GIUSTI, and C. MAAG (*Rev. Mens. Cdm. Merc.*, 13 (1913), No. 125, pp. 58-68).—This article outlines experiments in which a pituitary solution was injected into the blood stream of female animals with a view to determining the effect upon the milk secretion. The results corroborated those of Schäfer and Mackenzie (*E. S. R.*, 25, p. 680) and in general indicated a temporarily increased yield as the result of the injection of this solution.

Increase in the specific weight of freshly drawn milk, W. FLEISCHMANN and G. WIEGNER (*Jour. Landw.*, 61 (1913), No. 3, pp. 283-323).—Tests were conducted to determine the causes for the increase in the specific gravity or so-called "thickening" of milk, which takes place in the first few hours after milking and at temperatures under the melting point of milk fat. Investigations were made into the influence of the retention of absorbed gases on the specific gravity of milk, on the changes in the constitution of the milk sugars, on the consistency of the fat globules, and on the influence due to the so-called rise of casein. These explanations for the rise in specific gravity of freshly drawn milk were found to be unsatisfactory, and it was concluded that this phenomenon was due to the progressive coagulation of the milk fat, which is liquid at the time of milking.

Thickening did not occur when the milk was prevented from cooling at temperatures at which fat can coagulate, nor did it take place in separated milk in which the fat content was low. An increase in specific gravity was obtained under the requisite conditions with emulsions made from milk fat and water, while the phenomenon was not noticed with emulsions of oils which remain liquid at the temperatures in question. The increase in specific gravity of freshly drawn milk begins with the cooling under the melting point of the milk fats and lasts from 4 to 6 hours. Thereafter the specific gravity is constant at all temperatures.

The variation in the volatile fatty acids content of milk fat during the lactation period of 4 cows of the Royal Domain of Kleinhof-Tapiau, C. W. BEERBOHM (*Die Schwankungen im Gehalte des Butterfettes an flüchtigen Fettsäuren während der Laktation von 4 Kühen der Kgl. Domäne Kleinhof-Tapiau. Inaug. Diss., Univ. Königsberg, 1913, pp. 65, figs. 2*).—In these investigations it was found that the colostrum fat of the first milking had a very low content of water-soluble and insoluble volatile fatty acids. Both the period of lactation

and the feed had a distinct influence on the composition of the fats. There was an increase in the volatile water-insoluble fatty acids of the milk fat during almost the entire lactation period, and an increase in all of the volatile fatty acids during the spring and summer months when the cows were receiving pasture and green feed. The feeding of beets favored the formation of the volatile water-soluble and insoluble fatty acids.

Weather conditions had no appreciable influence on the character of the milk fat, but the individuality of the cow was found to be an important factor. The period of heat of the cow had the greatest effect on the diminution of the volatile soluble and insoluble fatty acids. A sudden change of feed effected an important change in the composition of the fats, noticeable only after several days of feeding.

With several of the cows there was an increase in the volatile water-soluble acids during the beginning of the lactation period, and a decrease with all the cows during the fall months. There was a larger amount of water-insoluble volatile fatty acids during winter feeding, and the smallest amount during the first few months of freshening. The insoluble volatile fatty acids in the fat in one case, however, was lower in the morning during the fall months and higher in the evening. Sickness of the cows produced a slight fall in the Reichert-Meissl and Polenske numbers. The highest value of the refraction exponent was in the fall months, and the lowest toward the end of the lactation period.

The maximum fall in the saponification number occurred during winter feeding, the minimum at the beginning of the lactation period. The highest Reichert-Meissl number was 32.44, the lowest 13.58; the highest Polenske number 4.89, the lowest 0.99; the highest Köttsdorfer number 242.4, the lowest 213.1. The highest refraction exponent was 48.2, the lowest 40.7. There was found to be a correlation between the refraction exponent and the other 3 factors.

On the milk fat of late milking cows, K. von FODOR (*Ztschr. Untersuch. Nahr. u. Genussmtl.*, 26 (1913), No. 5, pp. 235-237).—Comparing the milk fat of fresh cows and of those well along in lactation it was found at the experiment station for dairying at Magyar Ovar that the Reichert-Meissl numbers and saponification numbers were higher with the former than in the case of the latter, while the iodine test and refractive index were lower with the fat from the fresh cows.

First annual report of the International Association of Dairy and Milk Inspectors (*Ann. Rpt. Internat. Assoc. Dairy and Milk Insp.*, 1 (1912), pp. 131, fig. 1).—A compilation of papers and addresses delivered at this convention. It deals principally with the methods of inspection employed by the various city inspectors, but also includes papers on bovine tuberculosis eradication, economic milk production, and milk inspection from the standpoints of the producer and the milk dealer.

[Report on milk standards] (*Cream. and Milk Plant Mo.*, 2 (1913), No. 1, pp. 1-11, fig. 1).—This is the second report of the commission on milk standards and adopted by the American Public Health Association.

With respect to pasteurization it is recommended "that pasteurization of milk should be between the limits of 140° and 155° F. At 140° the minimum exposure should be 20 minutes. For every degree above 140° the time may be reduced by one minute. In no case should the exposure be for less than 5 minutes. . . . Pasteurization in bulk, when properly carried out, has proved satisfactory, but pasteurization in the final container is preferable." It is further urged that retail milk be labeled and marked, giving the grade of the milk and the date of production or of pasteurization.

The committee prescribes methods for bacteria count and the grading of milk accordingly. Definitions of the proposed grades of milk and cream are

given and provisions are made for the sale of homogenized and adjusted milks. It is advised that all milk be sold either under personal guaranty or under the regular state guaranty. Suggested standard rules for the production, handling, and distribution of both raw and pasteurized milk are appended.

Examination of Moscow market milk, A. WOJTKIEWICZ (*Centbl. Bakt. [etc.]*, 2. Abt., 39 (1913), No. 1-3, pp. 53-61).—A comparison is reported of the bacteria count, specific gravity, fat content, and general condition of the different grades of wholesale and retail milk in Moscow for the fall, winter, spring, and summer seasons, and of the relative percentage of sour milk bacilli, coli group, and gelatin-liquefying bacilli present during these seasons.

Methods of examination of clarifier milk slime, C. E. NORTH (*Abs. in Cream. and Milk Plant Mo.*, 2 (1913), No. 1, p. 19).—An examination was made of the slime resulting from the clarifying of milk.

Slime was invariably found in all milks, including certified. The amount of slime for individual cows ranged from 1.06 per cent to 1.14 per cent, and traces of slime were found in the milk even after the third and fourth clarification.

An analysis of this slime showed a total solids content of 30 per cent, of which 3 per cent was fat, 3 per cent ash, and the remaining 24 per cent nitrogenous organic compounds. Casein could not be found, and an occasional trace of blood was ascribed to the presence of pus. Purin, indicating the presence of cellular substances, was quite noticeable in fresh slime and decreased with the age of the slime. The presence of cellular elements, detected by microscopical examination, was ascribed to tissue cells and not pus cells. However, this point is under dispute. Occasional phagocytosis was noted. Mastitis milk frequently showed ten times the amount of slime that is found in normal milk.

Large numbers of bacteria were found in the clarifier slime, although there was no reduction in the bacterial count of the clarified milk. It is believed that in the process of clarifying, the clumps of bacteria are broken up by the force of the centrifuge, and that although a large number remain in the slime, the number of colonies is not materially lessened in the milk. In the belief that if the colonies were broken up by clarifying a subsequent pasteurization would be facilitated, experiments were made accordingly, but the results were disappointing.

In a discussion it is pointed out that leucocytes are always phagocytic, also that blood may be present in milk from herds not infected with any kind of disease. The presence of these bodies does not, therefore, necessarily denote the presence of pus cells.

Sampling for Babcock test, J. O. HALVERSON (*N. Y. Produce Rev. and Amer. Cream.*, 36 (1913), No. 21, p. 874).—Investigations were made to determine the factors which influence the percentage of milk fat obtained in ice cream samples. It was found that there was a great variance in these percentages, due to "(1) nonuniformity of the ice cream itself; (2) effect of testing charges taken at different times on ice cream samples which have stood, allowing the cream to rise to the top; and (3) method of mixing ice cream samples after having stood for some time."

On clean churning and related questions, L. F. ROSENGREN (*Meddel. Centralanst. Försöksv. Jordbruksområdet*, 1913, No. 77, pp. 24, figs. 4; *K. Landtbr. Akad. Handl. och Tidskr.*, 52 (1913), No. 4, pp. 254-275, figs. 4).—A study of the factors that influence the degree of the complete recovery of butter fat in churning cream in which the results of churning experiments with creams of similar fat contents at different churning temperatures, with cream of varying fat contents, and with churns filled with varying amounts of cream are pre-

sented. Trials with ice and artificial freezing mixtures in churning cream are also reported.

Brine salting cheese, J. H. MONRAD (*N. Y. Produce Rev. and Amer. Cream.*, 26 (1913), No. 18, pp. 754, 755).—The advantages claimed for this method are as follows:

"First of all it must be said that brine salting saves the cheese maker a good deal of work. The cheese lies in the brine 3 days and requires no work. The brine-salted cheese is firmer and hence easier and safer to take care of. Cheeses which lie in the brine are also salted quicker than by the old dry salting system, all of which saves considerable labor in making Emmental cheese. Another advantage is a saving in salt. If the preparation of the brine and the maintenance of its strength is done in a rational manner, nearly half the salt is needed. The brine-salted cheese keeps its shape better than by dry salting on the outside, is easier to keep clean, and preserves a fresher and more attractive appearance. The brine salting does not delay the ripening, indeed it rather hastens it."

In making the brine pure water is used, saturated with 20 per cent pure kitchen salt and at a temperature of 59° F. This method was first used in making skim milk cheese but has since been applied to the making of Limburger cheese.

Home cheese making without apparatus, A. CONLON (*Agr. Gaz. Tasmania*, 21 (1913), No. 6, pp. 208-212).—Directions are given for the making of home-made cheese.

Fresh cream cheese, A. ROLET (*Vie Agr. et Rurale*, 1913, No. 36, pp. 256-258, fig. 1).—A detailed explanation of the French method of making fresh cream cheese.

The manufacture of Grana cheese with a select ferment C. GORINI (*Agr. Mod. [Milan]*, 19 (1913), No. 13, pp. 147, 148, figs. 4).—Comparisons are made of the results obtained in the use of ordinary culture and a select ferment in the making of Grana cheese. It was demonstrated that with a select ferment the product is superior in consistency, taste, odor, and general condition.

On the abnormal ripening of Liptauer cheese, K. VON FODOR (*Ztschr. Untersuch. Nahr. u. Genussmtl.*, 26 (1913), No. 5, pp. 225-234, fig. 1).—In this article the author summarizes the results of tests made to determine the chemical and physical changes undergone in the ripening process of Liptauer cheese.

Reindeer milk and cheese, C. BARTHEL and A. M. BERGMAN (*Ztschr. Untersuch. Nahr. u. Genussmtl.*, 26 (1913), No. 5, pp. 238-241, figs. 2).—Four analyses were made of reindeer milk, the average composition being water 63.3, protein 10.3, fat 22.46, milk sugar 2.5, and ash 1.44 per cent. Reindeer cheese has a white color, a mild taste, and melts in the mouth. The rind has a sharp taste, but the inner portion has the characteristic delicate aroma of reindeer. The composition of the cheese is given as water 28.81, protein 22.57, fat 44.02, other organic matter 2.2, and ash 2.4 per cent.

The creamery industry: By-products and residues, A. ROLET (*L'Industrie Laitière: Sous-Produits et Résidus*. Paris, 1905, pp. VIII+395, figs. 162).—This volume treats very completely on all phases of creamery practice, dealing largely with the mechanical devices in common use, and treating of the manufacture of by-products such as fermented milk drinks and foods, condensed milk, and milk powder. The manufacture of a number of varieties of cheese is fully considered. Directions are given for determining the acidity and density of milk, and the extraction of milk sugar and the manufacture of alcohol and other products from waste milk are taken up in detail.

Experimental researches on the bacteriological and intoxicating character of the lactic acid food, "Gioddu," of Sardinia, G. ROSINI (*Mod. Zooiatro, Parte Sci.*, 1913, No. 3, pp. 87-100).—An account of the Italian lactic acid drink, "Gioddu," corresponding to yoghourt, koumiss, and kefir, and for which is claimed the property of antagonism to the pathogenic micro-organisms of the intestines.

VETERINARY MEDICINE.

Regional anatomy of domestic animals, L. MONTANÉ and E. BOURDELLE (*Anatomie Régionale des Animaux Domestiques. Paris*, 1913, pp. 1069; rev. in *Rec. Méd. Vét.*, 90 (1913), No. 5, pp. 195-199).—This is a new work intended for both the student of veterinary medicine and the practitioner.

Meat hygiene, T. E. MUNCE (*Penn. Live Stock Sanit. Bd. Circ.* 26, 1913, pp. 48, pls. 3, figs. 19).—This reports upon the abattoirs and meat inspection work in the larger municipalities of Great Britain, France, Germany, and Netherlands. A plan for either a private or municipal slaughterhouse is included.

Principles of milk hygiene for veterinarians, W. ERNST (*Grundriss der Milchhygiene für Tierärzte. Stuttgart*, 1913, pp. VIII+301, pls. 5, figs. 26).—This is the first edition of this work, which seems to have many features that are different from other works previously published on milk hygiene. Its contents are as follows: Anatomy, pathology, and the finer structure of the mammary gland; physiology of milk secretion and properties of milk in general; microscopy of milk; composition of milk and its biological, chemical, and physical properties; the production of cow's milk; internal and external causes affecting the composition of milk; bacteria in market milk and their origin and action upon milk; control of the milk supply; laws relating to the milk supply; and the examination of milk.

The book is illustrated with many plates and drawings.

Müller's serodiagnostic methods, P. T. MÜLLER, trans. by C. R. WHITMAN (*Philadelphia and London*, 1913, 3. ed., pp. XIII+146, figs. 7).—A clear, concise description of the methods used in serodiagnosis, with especial reference to human medicine, translated from the third German edition.

On the mechanism of complement fixation, H. R. DEAN (*Jour. Hyg. [Cambridge]*, 12 (1912), No. 3, pp. 259-289; abs. in *Ztschr. Immunitätsf. u. Expt. Ther.*, II, Ref., 6 (1913), No. 15, p. 1118).—The author finds that by making a series of dilutions with antisera, it is possible to determine the point where a definite amount of antigen will combine with the complement. In the absence of the latter it will give no precipitate, but if complement is added, a precipitate appears after several hours. By adding more complement a limited increase in the precipitate is noted.

Instead of using complement the same results can be obtained with the euglobulin prepared from guinea-pig serum. The precipitation of euglobulin is practically the same as that produced by carbon dioxide. The middle portion is fixed much quicker by the precipitation of an antigen-antiserum mixture than the end portion. The results show that the fixation of the constituents of complement is similar to the fixation which occurs with inorganic substances, e. g., barium sulphate suspensions, and that adsorption plays an apparent rôle in complement fixation.

Meiostagmin reaction and pregnancy, A. FULCHIERO (*Biochim. e Terapia Sper.*, 4 (1912), No. 3, pp. 58-61; abs. in *Ztschr. Immunitätsf. u. Expt. Ther.*, II, Ref., 6 (1913), No. 15, p. 1056).—In the experiments 35 sera from pregnant women and 35 control sera were examined with the meiostagmin reaction, 3 different kinds of methyl alcohol extracts being employed. All of the

sera from the pregnant women showed high values, but certain neoplastic sera gave increased figures also.

Glycosuria and allied conditions, P. J. CAMMIDGE (*London, 1913, pp. VII+467, figs. 2*).—This book, while dealing particularly with glycosuria, diabetes insipidus, etc., as they occur in man, is especially valuable for veterinarians interested in diseases of metabolism. It deals with the classification, properties, and physiology of the carbohydrates and their derivatives; the detection and differentiation of sugars and other reducing substances in the urine; the determination of the sugars, acetone bodies, nitrogen, etc., in the urine; experimental glycosuria; alimentary, transitory, and intermittent glycosuria; persistent glycosuria—urinary changes, blood and clinical symptoms, pathology and diagnosis, metabolism, treatment and prognosis; levulosuria, maltosuria, the occurrence of isomaltose, laiase, heptose, paidose, glycogen, animal gum, and inosit in the urine; lactosuria, galactosuria, saccharosuria, pentosuria, and the occurrence of glucuronic acid in the urine; alkaptonuria, diabetes insipidus; and the chemical properties and reactions of the carbohydrates and related substances.

Many bibliographical references are appended.

Experimental studies in glycosuria immunity, F. LANZARINI (*Riv. Clin. Pediatr.*, 10 (1912), No. 3, pp. 185-203; *abs. in Ztschr. Immunitätsf. u. Expt. Ther.*, II, Ref., 6 (1913), No. 15, p. 1057).—By treating a sheep subcutaneously with slowly increasing doses of glucose, it was possible later to give the animal a large amount of glucose without having it appear in the urine. A glucose-splitting ferment is elaborated in the system but the immunity produced is not permanent. The same findings were noted in a goat receiving saccharose but some of the enzymes produced in the blood were noted in the milk.

On the distribution of potassium in renal cells, C. P. BROWN (*Trans. Canad. Inst.*, 9 (1912), III, No. 22, pp. 389-407, pls. 2).—"The sodium cobalt hexanitrite reagent ($\text{CoNa}_3(\text{NO}_2)_6 + n\text{H}_2\text{O}$), as prepared by Professor Macallum, is a suitable reagent for the localization of potassium in kidney tissue. It is essential that the tissue be frozen while perfectly fresh, and that the sections prepared from it be kept frozen until they come in contact with the reagent. There is a definite localization of potassium on the external surface of the convoluted tubules and frequently about their lumina as well. The uniformity of this localization about the tubules tends to increase in direct proportion to the state of activity of the kidney. In the resting condition or during ordinary activity the only potassium demonstrable in the cytoplasm of the cells of the convoluted tubules is condensed in a layer immediately adjacent to the lumen border in each cell. This localization appears to be in accordance with surface tension phenomena.

"The presence of potassium in the lumina of the tubules and absence of potassium in the glomerular cavity is evidence that the inorganic salts are excreted by the tubule cells. No evidence bearing on the manner in which the glomeruli perform their function was obtained. In no instance was any potassium found in a cell nucleus. The amount of potassium in the kidney of the dog and even of the frog exceeds that of the sodium, and in the dog it exceeds greatly the amount of potassium in the blood or plasma."

The toxicity of gentian violet and its fate in the animal body, J. W. CHURCHMAN and L. F. HERZ (*Jour. Expt. Med.*, 18 (1913), No. 5, pp. 579-583, pls. 2).—Observations of the bactericidal properties possessed by gentian violet, and particularly of its affinity for pyogenic organisms, led the authors to attempt to determine the toxicity of this substance and its fate in the animal body. They here report upon a series of some 75 experiments made on dogs and rabbits.

Rabbits which received enormous doses (10 cc. of 1:200 solution) remained alive and were still perfectly well a number of months after the experiment. In another group of experiments, however, the animals died within a minute or so after injection. These experiments showed conclusively that blood withdrawn from animals thus injected possesses the selective bactericidal power of the dye, but that this power disappears completely in about 2 hours. There is no similar loss of selective bactericidal power when the dye is simply allowed to remain in contact with blood in vitro. Intravenous injection of gentian violet was found to result in prompt and fairly deep staining of the visible mucous membranes, and also appears in the mucous membranes lining the gastro-intestinal tract. The visible membranes remained stained about 48 hours, the stain disappearing slowly during this time.

The fate of the dye in other organs has not been determined. Frozen sections of tongues of dogs and rabbits painted with strong solutions of the dye showed that penetration had occurred through the thickness of the mucosa down to the muscularis.

Experiments on the cultivation of so-called trachoma bodies, H. NOGUCHI and M. COHEN (*Jour. Expt. Med.*, 18 (1913), No. 5, pp. 572-578, pl. 1).—"An organism was isolated and studied in pure cultures from cases of conjunctivitis accompanied by the so-called trachoma body inclusions, as well as from a case of old trachoma without inclusions. This organism was not found in the cultures made from other forms of conjunctivitis in which the inclusions were absent. The organism presents the morphological features characteristic of so-called trachoma bodies. It undergoes an early transformation, during which the forms known as initial bodies appear, and a later change, during which forms resembling elementary granules arise, while certain intermediate forms between these occur simultaneously. No definite cell inclusions could be produced in monkeys by inoculating pure cultures of the organism. The cultivation of this organism from a case of trachoma without the cell inclusions, together with the previously ascertained fact that the inclusions can be produced in suitable animals by inoculating such material directly from a human case, suggests the possibility of the organism being still present in such cases of trachoma, although not in the form of cell inclusions.

"The facts presented justify the statement that by a suitable method an organism resembling the various important stages of the trachoma bodies and totally distinct from the gonococcus has been obtained in a living condition capable of indefinite cultivation from cases of human trachoma and inclusion conjunctivitis. Whether the organism and trachoma bodies are identical can not be positively stated at present. But the way is now opened to determine this point, as well as the specificity of the trachoma bodies."

On the toxins of ascarids, H. DOBERNECKER (*Über Toxine der Askariden. Inaug. Diss., Univ. Bern, 1912, pp. 37*).—In this paper the author first reviews the literature at length (pp. 3-15) and then reports his own investigations. He concludes that the ascarids contain toxins in their body fluid which in man act particularly on the brain and in animals on the spinal cord, as well as irritating the skin and mucous membranes; that male and female ascarids of the same genus are equally toxic; that the body fluid of *Ascaris megalocephala* is more toxic than that of *A. lumbricoides*; and that the toxic action of the body fluid of ascarids is destroyed by the gastric juice.

Verminous toxins: A review, WEINBERG (*Bul. Inst. Pasteur, 10 (1912), Nos. 22, pp. 969-977; 23, pp. 1017-1026; 24, pp. 1065-1072*).—This paper, presented at the First International Congress of Comparative Pathology, held at Paris in October, 1912, deals with the subject under the headings of (1) indirect evidence, including verminous eosinophilia, and the passage of verminous toxins

into the host; and (2) direct evidence, including hemotoxins, toxicity of the liquids of parasitic cysts, ascarid toxins, teniotoxins, and the bactericidal properties of helminths. A bibliography of 2 pages is appended.

Investigations of a nematode and its faculty of producing papillomatous and carcinomatous neoformations in the stomach of the rat, J. FIBIGER (*Overs. K. Danske Vidensk. Selsk. Forhandl.*, 1913, No. 1, pp. 47-87).—A hitherto unknown disease of the stomach and of the esophagus of the rat (*Mus decumanus*), endemic in a single limited locality, was found to be caused by an undescribed nematode of the genus *Spiroptera*. The adult nematode infests the epithelium of the stomach and esophagus.

The cockroaches *Periplaneta americana* and *P. orientalis* serve as intermediate hosts. The eggs of the nematode which pass out in the excrement of the rat are ingested by the cockroaches, develop, and the embryos become localized in the striated muscles of the prothorax and the legs. The rats become infested by eating cockroaches, and the embryos of the worm, set free from their cysts, attack the epithelium of the stomach, sometimes also that of the esophagus, tongue, and buccal cavity, and develop into the adult nematode. The author's investigations lead him to conclude that all the anatomical alterations are due to toxic products of the nematode.

From the primary lesions caused by the nematode secondary metastases may be produced in other organs; the metastases contain neither the parasites nor their eggs. The development of the metastases is due to the faculty of the epithelial cells of multiplying in other organs independently of the parasite. The author thus confirms the view put forward by Borrel and Haaland that nematodes may produce malignant tumors in rats and mice.

A contribution to the study of nematode parasites of the dog's eye, A. RAILLIET and A. HENRY (*Bul. Soc. Cent. Méd. Vét.*, 90 (1913), No. 10, pp. 209-215, figs. 6).—Following a review of the reports of 3 observations by others of nematode parasites in the dog's eye, 2 relating to intra-ocular parasites and 1 to an extra-ocular parasite, the authors report on the occurrence of a fourth, a female *Hæmostrongylus vasorum*, in the anterior chamber of the eye of a dog at Laval, France.

Combating contagious abortion, HASENKAMP (*Arch. Wiss. u. Prakt. Tierheilk.*, 39 (1913), No. 4-5, pp. 422-434, fig. 1).—A description of epizootics of contagious vaginal catarrh and contagious abortion which occurred in all of the districts of the Province of Westphalia.

The light acute cases of vaginal catarrh were treated successfully with Bengen's vaginal capsules, but the severe acute cases did not respond to this treatment despite the fact that it was continued for weeks and the stables were thoroughly disinfected. Bissulin also did no good. In 3 barns unsatisfactory results were obtained with Gans' lymph.

As the tampon method seemed to present some favorable features, it was tried, and for preventing the tampon from being expelled, a special form of apparatus was constructed which the author calls the tampon holder or retainer. The tampons before insertion were impregnated with a 3 per cent lysoform or sapoform solution, and were kept in the vaginal cavity for 24 hours. In severe cases a new tampon was inserted for 12 hours longer. In about 5 days the lesions in the mucous membrane of the vaginal canal had been removed. The method was used in 1,000 cases and was applied by 8 veterinarians. It is deemed advisable after the disease has been removed to wash out the vaginal cavity with a 2 per cent solution of sodium bicarbonate, especially before the animal is served.

For combating contagious abortion in cows Schreiber's method (*E. S. R.*, 28, p. 380) was used in 2 establishments, but found to be unsatisfactory,

although the animals received in addition a subcutaneous injection of 10 cc. of a 2 per cent carbolic-acid solution each week. Also the animals in 6 small herds were divided into 2 groups, one-half receiving Schreiber's lymph and the other half being treated by Bräuer's carbolic-acid method.^a Bräuer's method gave the better results, and Schreiber's lymph is not a certain method for preventing abortion. See also the work of Taylor (E. S. R., 28, p. 781).

Peptotoxin production by the bacillus of contagious abortion of cattle, J. REICHEL and M. J. HARKINS (*Centbl. Bakt. [etc.]*, 1. Abt., Orig., 69 (1913), No. 3, pp. 142-163).—The *Bacillus abortus* was found to produce a toxin when cultivated on a medium containing peptone, but would not develop it on a non-peptonized medium. It was possible to remove the toxin from the bacilli by thoroughly washing with water. By adding alcohol to the supernatant fluid obtained from a suspension of bacilli grown on peptonized agar, a precipitate was obtained which contained the toxic substances. Heating the toxin for 30 minutes at 65° C. had apparently no effect on its toxic properties. It was found, however, that in order to make cattle react toward the toxin they must first be sensitized to it.

"*B. typhosus*, *B. coli communis*, *B. tetani*, and pneumococcus cultures on peptonized agar revealed the presence of peptotoxin when injected into animals sensitized to the abortus bacillus or its products. The peptotoxins of these organisms probably have much in common, if they are not one and the same substance, because animals can be sensitized with one for any of the others. No reactions were observed following the injections into sensitized animals of peptonized agar cultures of the diphtheria bacillus, *Staphylococcus pyogenes aureus*, nonhemolytic streptococcus, and hemolytic streptococcus, which may mean that the organisms did not produce peptotoxin or only in very small amounts.

"Rabbits developed agglutinins following the injection of thoroughly washed and unwashed abortus bacilli equally well. The peptotoxin injected with the unwashed bacilli is not essential in the production of antibodies. In that the abortus bacillus produces peptotoxin in a protein medium and it is a possibility that peptotoxin is produced in milk with the bacilli from cattle in infected herds, the wholesomeness of such milk is more questionable."

Certain individual differences were noted in the amounts of peptotoxin produced by various strains of the *B. abortus*, as noted by McFadyean et al. (E. S. R., 22, p. 584).

Hyperimmunization of horses for obtaining an antianthrax serum, I. G. EIGEN (*Arch. Vet. Nauk. [St. Petersburg.]*, 42 (1912), No. 7, pp. 637-646; *abs. in Centbl. Bakt. [etc.]*, 1. Abt., Ref., 56 (1913), No. 12, p. 357).—The serum can be obtained in as short a time as 3 months providing the horses are treated daily with small doses of virulent anthrax bacilli.

Testing of Grugel's vaccine against foot-and-mouth disease, NEVERMANN (*Berlin. Tierärztl. Wchnschr.*, 29 (1913), No. 30, pp. 537, 538).—In the experiments 13 cattle were used. Ten of these were treated with the vaccine and 3 were kept as controls. In no case did the vaccine prove of any value for protecting animals against foot-and-mouth disease.

Technique and practical significance of precipitation for the intravital and post-mortem diagnosis of glanders, J. LENFELD (*Ztschr. Infektionskrankh. u. Hyg. Haustiere*, 14 (1913), No. 1, pp. 68-90).—Precipitation is deemed an important aid for diagnosing the intravital presence of glanders. A systematic examination of blood resulted in establishing the presence of the disease in 100 per cent of the cases, while 1 examination of blood showed it to be present in

^a Deut. Ztschr. Thiermed., 14 (1889), No. 1-2, pp. 95-101.

62 per cent, and when the test was made in combination with the ophthalmic reaction, 78 per cent of the cases were detected.

For the post-mortem detection of the disease the test will probably prove positive each time that the organs are utilized for making the extracts.

About the preparation of bacillary extracts for complement fixation, W. PFEILER and G. WEBER (*Ztschr. Immunitätsf. u. Expt. Ther.*, 1, Orig., 15 (1912), No. 2-3, pp. 180-185; abs. in *Centbl. Bakt. [etc.]*, 1, Abt., Ref., 56 (1913), No. 12, p. 359).—It was found that repeated shaking of the glanders bacillus suspensions in preparing extracts was unnecessary. It is sufficient simply to centrifuge the suspension and to utilize the uppermost clear fluid for the tests. Bacillary suspensions could be boiled without affecting their activity. An analogous finding was noted with the hog cholera bacillus and other micro-organisms.

Malta fever: Cases occurring in Arizona, C. E. YOUNT and R. N. LOONEY (*Ariz. Med. Jour.*, 1 (1913), No. 4, pp. 18-27; abs. in *Jour. Amer. Med. Assoc.*, 60 (1913), No. 22, p. 1740).—A description of 5 cases of malta fever in man, as previously noted (*E. S. R.*, 27, p. 884).

Malta fever in Louisiana, C. WELLMAN, A. EUSTIS, and S. S. SCHOCHET (*Amer. Jour. Trop. Diseases and Prev. Med.*, 1 (1913), No. 5, pp. 393-396, fig. 1).—The authors report upon a case of Malta fever in a man, detected at New Orleans by means of the agglutination tests, who evidently became infected in Jackson County, Texas.

Immunizing tests against rabies, H. MIESSNER, KLIEM, and KAPFBERGER (*Arch. Wiss. u. Prakt. Tierheilk.*, 39 (1913), No. 3, pp. 169-209; abs. in *Berlin. Tierärztl. Wchnschr.*, 29 (1913), No. 21, p. 386).—The purpose of the work was to devise a method for immunizing domesticated animals against rabies. The various methods used for man are based on the principle that small doses of attenuated fixed virus are necessary to bring about immunity. In these experiments it was found that with 3 intravenous injections of fixed virus it was possible to produce an immunity, providing the control infection of the animal was allowed to follow some weeks later. The formation of immune bodies proceeds slowly. For the dog the intra-abdominal route is preferred. The curative treatment occupies a secondary position. It is advisable to immunize all animals (dogs) yearly.

The tests for preparing a highly potent immune serum for all classes of animals have not been completed. Tests with salvarsan against this disease were conducted but with negative results. The detection of Negri bodies in rabbits used for the transference (passage) experiments with fixed virus was successful in 80 per cent of the cases. The transference of virus from mother to fetus was also noted. Three animals (1 sheep and 2 rabbits) infected with street (passage) virus became rabid in 2 days. The aqueous and vitreous humor of rabid rabbits' eyes can produce typical rabies when injected into other rabbits.

New immunizing tests in rabies, W. PFEILER (*Berlin. Tierärztl. Wchnschr.*, 29 (1913), Nos. 14, pp. 249-252; 15, pp. 269-273).—After giving a description of the research work which led up to the discovery of the antirabic vaccination and the details of the various modifications of Pasteur's method, attention is called to the value of immunizing domesticated animals against rabies. The number of tests thus far conducted is regarded as inadequate to properly judge the efficiency and practical utility of immunization.

The results of tests conducted at the Emperor William Institute of Agriculture at Bromberg by Miessner, Kliem, and Kapfberger are discussed in the article. All animals, with the exception of those from which it was desired to obtain an immune serum, were immunized by the rapid method. Some of the tests seemed satisfactory while others were entirely discouraging.

The author has had under observation over 30 dogs which were completely immune and thoroughly refractory toward rabies. The animals received from 4 to 8 gm. of fixed virus intraperitoneally and these amounts were able to protect the animals against an infection with fixed or street virus which was given 14 days following the vaccination. Subcutaneous injections, when given as recommended by Ferran, always produced a strong inflammation of the subcutaneous tissue, consequently this method of injection was abandoned. A part of the animals were infected either subdurally several months later, or were bitten by a rabid animal, with the result that all of the animals remained sound. In another series of experiments manifestations of immunity were noted when immune serum was injected intravenously, subcutaneously, or intraperitoneally in animals, but when the serum was introduced into the spinal canal the animals (dogs and sheep) were absolutely protected. Probably a local immunity was concerned here. With this new intraspinal method 16 sheep, about 20 dogs, about 80 rabbits, and 1 horse were treated.

In regard to Miessner's report with reference to immunizing animals against rabies, W. PFEILER (*Berlin. Tierärztl. Wchnschr.*, 29 (1913), No. 30, pp. 540-543).—A polemic.

Immunizing dogs against rabies, W. PFEILER and G. KAPFBERGER (*Ztschr. Infektionskrank. u. Hyg. Haustiere*, 13 (1913), No. 6, pp. 307-316).—This is a detailed statement of the results of an investigation, noted above, with experimental data.

In regard to immunizing against rabies, MIESSNER (*Berlin. Tierärztl. Wchnschr.*, 29 (1913), No. 31, p. 558).—A reply to the above.

Sporotrichosis of animals, DE BEURMANN and GOUGEROT (*Rev. Gén. Méd. Vét.*, 21 (1913), Nos. 250, pp. 557-586; 251, pp. 626-645, figs. 21).—This paper on the comparative pathology of sporotrichosis takes up the subject under the headings of spontaneous sporotrichosis of the rat, dog, mule, and horse; experimental sporotrichoses of animals; clinical diagnosis; and prognosis and treatment.

The trypanosomes causing dourine (*mal de coït* or *Beschälseuche*), B. BLACKLOCK and W. YORKE (*Proc. Roy. Soc. [London]*, Ser. B, 87 (1913), No. B 593, pp. 89-96, pl. 1, figs. 3).—This is in continuation of work of which a preliminary account has been previously noted (*E. S. R.*, 27, p. 884). The morphology of three strains of the trypanosome, supposedly *Trypanosoma equiperdum*, one originating in Algiers and the other two in Germany, was studied. The authors are led to conclude that the symptom-complex of the disease, clinically known as dourine, can be produced by more than one species of trypanosome. They were unable to distinguish morphologically the Algerian form from *T. rhodesiense*, *T. pecaui*, *T. brucei*, and *T. ugandæ*.

Studies of the piroplasmoses occurring in Algeria (*Bul. Soc. Path. Exot.*, 6 (1913), Nos. 8, pp. 571-574; 9, pp. 618-623).—The first paper (pp. 571, 572), by E. Sergent, A. Lhéritier, and R. Ismert, relates to equine piroplasmosis in Algeria and its cure by trypanblue; the second paper (pp. 573, 574), by E. Sergent and M. Beguet, reports upon the occurrence of *Anaplasma marginale* in cattle in Algeria. An acute and very grave case of piroplasmosis in a horse was observed in a region from which the disease had not previously been reported but where bovine piroplasmosis is enzootic. This case rapidly recovered following the injection of trypanblue. A number of preparations of blood from cattle presenting symptoms of piroplasmosis were found to contain *A. marginale*. The third paper (pp. 618-622), by E. Sergent, A. Lhéritier, and A. Boquet, relates to the treatment of bovine piroplasmosis by trypanblue; the fourth paper (pp. 622, 623), by E. Sergent and A. Lhéritier, reports upon an intense piroplasma infection in apparently healthy cattle.

Tubercle bacilli in the circulating blood in surgical tuberculosis, M. KRABBE (*Deut. Ztschr. Chirurg.*, 120 (1913), No. 3-4, pp. 370-378; *abs. in Jour. Amer. Med. Assoc.*, 60 (1913), No. 9, p. 705).—Eighteen patients having surgical tuberculosis were examined for the presence of tubercle bacilli in the blood, and in 12 of the cases the organisms were found. Five subjects having tuberculous lymph nodes showed positive in one case, and positive results were obtained in 1 out of 4 cases having tuberculosis of the mucosa, skin, or tendon sheaths.

Report on the results of a chemical investigation [of the tubercle bacillus], A. HARDEN (*Roy. Com. Tuberculosis, Final Rpt., pt. 2, 6* (1913), pp. 34).—This details the results of an investigation instituted at the request of the Royal Commission on Human and Animal Tuberculosis for the purpose of ascertaining whether it is possible by chemical means to differentiate between the human and bovine types of bacilli. The viruses employed were of bovine, porcine, and human origin.

Part 1 of the work deals with the changes produced by growing the bacilli in glycerol veal broth. The determinations made after filtering off the bacterial growth, which was weighed, were total nitrogen, nitrogen nonprecipitable by tannic acid, nitrogen nonprecipitable by phosphotungstic acid, free and saline ammonia, ammonia liberated by hydrolysis with hydrochloric acid, acidity of the medium to phenolphthalein in the cold and at the boiling point, acids soluble in ether, and the amount of glycerol present.

From this part of the investigation it was concluded that "no definite physiological difference has been detected between tubercle bacilli of different origins. Such differences as exist between the amounts of action exerted on glycerol beef broth by different cultures are probably to be attributed to differences between the weights of organisms formed, the times of incubation, and individual characteristics of the strains. When *Bacillus tuberculosis* is cultivated on glycerol broth, the proteins of the broth undergo hydrolysis to a considerable extent. Glycerol is partially removed by oxidation. There is no evidence that consumption of glycerol is directly related either to weight of culture obtained or to change in acidity. The initial fall in the acidity of the medium is largely due to the removal of the acids soluble in ether (lactic acid, etc.). Further important factors in producing change in acidity are the production and removal of ammonia (free and saline) and the digestion of the proteins."

Part 2 is devoted to a study of the relation of the ash and phosphoric acid present in tubercle bacilli of different origins. The conclusion is reached that it is impossible to characterize tubercle bacilli of different origins by the amount or composition of the ash, or the phosphoric acid which they contain. See also other notes (E. S. R., 10, p. 1016; 13, p. 994; 14, p. 693).

Hypersensitiveness to tuberculo-protein and to tuberculin, C. R. AUSTRIAN (*Bul. Johns Hopkins Hosp.*, 24 (1913), No. 267, pp. 141-147; *abs. in Jour. Amer. Med. Assoc.*, 60 (1913), No. 21, p. 1665).—The experiments confirm other already demonstrated facts that "(1) a protein substance can be obtained by the extraction of tubercle bacilli with water, and with it animals can be actively sensitized; (2) that a refractory condition to this protein can be produced; and (3) that the hypersensitive condition is transmitted from mother to young. [The author's] experiments establish further that active sensitization induced by treatment with this protein may be as regular in its development and as intense in its manifestation as is that produced by treatment with other proteins. Passive homologous and heterologous hypersensitiveness can occasionally be produced with the blood or with the serum of an actively sensitized animal. The material transmission of the hypersensitiveness does not take place through the milk. The regularity with which maximum hypersensitive-

ness can be produced is largely dependent on the use of a sufficient amount of protein in preparing and in testing the animals. All the manifestations of typical hypersensitiveness to protein can be produced in guinea pigs by treatment with aqueous extracts of tubercle bacilli. Guinea pigs can be sensitized with albumose-free tuberculin and with old tuberculin that has been freed of glycerol and made poor in salts; and sensitization with any of these products causes the animal to react to injections of the others.

"Hypersensitiveness to tuberculin develops within 7 to 15 days after infection with the *Bacillus tuberculosis*. Tuberculous animals can occasionally be intoxicated with tuberculo-protein, developing symptoms of hypersensitiveness. The passive transference of hypersensitiveness from a tuberculous man to normal guinea pigs has been successfully accomplished and positive results have likewise been obtained when the serum of a sensitized animal has been injected into an untreated one. The type of the reaction symptoms and the development of them in an infected host after the administration of minimum doses of tuberculin are likewise suggestive facts."

The author is of the opinion that the evidence gathered justifies the interpretation of the tuberculin reaction as a manifestation of hypersensitiveness.

Tuberculin in diagnosis and treatment, L. HAMMAN and S. WOLMAN (*New York and London, 1912, pp. XIV+381, figs. 35*).—This publication contains a detailed description of the various tuberculin reactions utilized at the present time, and discusses the scientific principles underlying the diagnostic and therapeutic use of tuberculin. These topics are considered particularly from the human standpoint.

The relative value of turtle tuberculin in the treatment of tuberculosis, W. J. BEATTIE and E. E. MYERS (*N. Y. Med. Jour.*, 98 (1913), No. 11, pp. 503-507).—A discussion in regard to Piorkowski's antigen, the Friedmann cure, and von Ruck's vaccine. The use of Piorkowski's tuberculin for this disease in man is described in detail.

Treatment of tuberculosis with attenuated tubercle bacilli treated with sodium fluorid, G. RAPPIN (*Arch. Gén. Méd.*, 203 (1913), pp. 262-278; *abs. in Jour. Amer. Med. Assoc.*, 60 (1913), No. 19, p. 1497).—The vaccines used in treating laboratory animals were made from attenuated tubercle bacilli deprived of their protective envelope by sodium fluorid. The cultures used in the experiments have been cultivated since 1894, and this is the fourth report on the topic. The results obtained with guinea pigs were very satisfactory.

On a remarkable new type of protistan parasite, H. M. WOODCOCK and G. LAPAGE (*Quart. Jour. Micros. Sci. [London]*, n. ser., 59 (1913), No. 235, pp. 431-457, pls. 2, figs. 2).—This paper describes a new type of parasitic Protista which inhabits the rumen of animals, especially of the goat, to which the authors have given the name *Selenomastix ruminantium*.

"Apparently the only flagellates from which the organism could be derived are the dinoflagellates and, apart from the transverse division, there is no indication of any affinity with this group. Further, the nature of the nucleus and the capacity of moving by the body alone make it very doubtful if this parasite is a true protozoan. *S. ruminantium* differs in important respects from any known bacteria. It has no affinities with schizosaccharomycetes, with Blastocystis, nor with the spirochetes. In certain characters it shows a resemblance to one or two large spirillar forms, or to certain members of the sulphur bacteria (e. g. *Ophidomonas*), but while its derivation is possibly to be sought in this direction, it is, nevertheless, very far removed from such forms. We may have in *Selenomastix* an example of a proflagellate."

The relation of lungworms of sheep to those of deer, E. RICHTERS (*Ztschr. Infektionskrank. u. Hyg. Haustiere*, 13 (1913), No. 5, pp. 251-272, figs. 15; *abs.*

in *Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases*, 4 (1913), No. 7, pp. 1058, 1059).—Investigations were carried on to determine the species of *Strongylus* occurring in the lungs of sheep and deer and how the embryos and mature parasites differ from each other.

On an average, 95 per cent of those found in sheep are *Strongylus filaria* (*Dictyocaulus filaria*) and 5 per cent *S. commutatus* (*Synthetocaulus commutatus*). In many hundreds of lungs examined by the author no other species were found. The sexually mature worms occurred either in the tracheæ or in the bronchi, never in the lung tissue. The author finds *S. commutatus* to be a distinct species, but, contrary to hitherto accepted opinions, *S. capillaris* (*Synthetocaulus capillaris*) and *S. rufescens* (*Synthetocaulus rufescens*) found in sheep appear to be identical.

The lungworms found in deer are exclusively *S. micrurus* (*Dictyocaulus viviparus*), neither *S. micrurus*, *S. sagittatus* nor any other species being found in the 100 cases investigated. Thus it would appear that the lungworms of sheep are distinctly different from those of the deer and that transmission from sheep to deer is very unlikely.

A bibliography of 64 titles is appended.

Anaplasmosis of the sheep in German East Africa, O. TRAUTMANN (*Berlin. Tierärztl. Wchnschr.*, 29 (1913), No. 33, pp. 593, 594).—The author confirms the previous observations of Schellhase* of the occurrence of anaplasmosis (*Anaplasma marginale*) of sheep in German East Africa.

Cholera in northwest Iowa, O. W. JOHNSON (*Breeder's Gaz.*, 64 (1913), No. 22, pp. 1038, 1039).—It is pointed out that hog cholera may be disseminated by crows, since they feed on the carcasses of dead hogs and may then fly from 1 to 20 miles and light in hog pastures or in trees under which hogs seek shade.

The practical treatment of the horse, W. H. EDGAR (*Atlanta, Ga.*, 1913, pp. 96).—A popular account.

Cerebro-spinal meningitis of the horse, B. F. KAUFF (*Amer. Vet. Rev.*, 44 (1913), No. 1, pp. 75–87, fig. 1).—The author discusses the history of the outbreak of cerebro-spinal meningitis in the Middle West in 1912, particularly in Colorado, and its differential diagnosis; and reports several cases of the disease, including histological and bacteriological studies. He states that no definite conclusion as to the cause of the disease can at the present time be drawn.

Treatment of pectoral influenza (Brustseuche) with neosalvarsan, STÖDTER (*Berlin. Tierärztl. Wchnschr.*, 29 (1913), No. 11, pp. 195–198; *abs. in Rev. Gén. Méd. Vét.*, 21 (1913), No. 249, pp. 518–520).—Two horses treated by the author on the third day and a third on the fourth day of the disease, with intravenous injections of 4½ gm. of neosalvarsan in 130 gm. of lukewarm (22° C.) 0.4 per cent salt solution, made rapid recoveries. The only objection to the use of this preparation is its high price, each injection costing 42 marks (\$10.00), and it is estimated that the high percentage of recovery resulting, the shortening of the course of the disease, and the complete and definite cure make its use economical. It is stated that during 1911, 226 animals were treated with salvarsan with but a single loss, although the usual mortality from the disease runs from 5 to 20 per cent.

Concerning the beri-beri-preventing substances or vitamins contained in rice polishings—a sixth contribution to the etiology of beri-beri, E. B. VEDDER and R. R. WILLIAMS (*Philippine Jour. Sci., Sect. B*, 8 (1913), No. 3, pp. 175–195).—Investigations are reported in continuation of earlier work (E. S. R., 29, p. 180).

Some of the conclusions follow which were drawn from experiments reported.

* Berlin. Tierärztl. Wchnschr., 28 (1912), No. 28, pp. 511, 512.

"Undermilled rice may be stored for 1 year in a damp place without losing its protective powers against polyneuritis gallinarum. It is improbable therefore that a rice which originally affords protection against beri-beri will lose this property by storage even in damp places. . . .

"The therapeutic properties of an alcoholic extract of rice polishings are greatly altered by hydrolysis (treatment with 5 per cent hydrochloric or sulphuric acid). The unhydrolyzed extract is not poisonous and is only slowly curative. The hydrolyzed extract is exceedingly poisonous in large doses and promptly curative in small doses.

"We have confirmed Funk's observations by isolating a crystalline base from an extract of rice polishings by Funk's method. This base in doses of 30 mg. promptly cured fowls suffering from polyneuritis gallinarum. . . .

"Two groups of substances (purin bases, cholin-like bases) may be isolated from rice polishings in addition to Funk's base and are capable of partly or wholly protecting fowls fed on polished rice against polyneuritis gallinarum, but are incapable of curing fowls that have already developed the disease. The chemical nature of these two groups of bases requires further investigation. . . .

"It is probable that this base [Funk's base] or vitamin exists in food as a pyrimidin base combined as a constituent of nucleic acid, but that it is not present in the nucleins or nucleic acids that have been isolated by processes involving the use of alkalis or heat."

The authors regard their results as affording striking and confirmatory evidence for the hypothesis which has been previously advanced that wet beri-beri and dry beri-beri are two distinct conditions, each being caused by the deficiency of a separate vitamin.

Other conclusions have to do chiefly with the chemical characteristics of the vitamins and clinical experience.

The use of milk cultures of *B. bulgaricus* in the prevention and treatment of bacillary white diarrhea of young chicks, L. D. BUSHNELL and O. MAUREB (*Amer. Vet. Rev.*, 44 (1913), No. 2, pp. 194-207).—Following a general review of the subject the authors report feeding experiments with *Bacillus bulgaricus* and *B. pullorum*, which they consider, demonstrate the effectiveness of milk cultures of *B. bulgaricus* in this disease.

The treatment of fowl cholera with quinin, HALLENBERGER (*Arch. Schiffs u. Tropen Hyg.*, 17 (1913), No. 13, pp. 466, 467).—The author has found the injection of 0.5 gm. quinin bimuriate to give good results both as a therapeutic and prophylactic agent.

A list of current medical periodicals and allied serials (*Chicago: John Crerar Library*, 1913, 2. ed., pp. 32).—A list of medical periodicals which deal both with human and veterinary medicine.

RURAL ENGINEERING.

Irrigation from reservoirs in western Kansas and Oklahoma (*U. S. Senate*, 62. Cong., 3. Sess., Doc. 1021, 1913, pp. 54, pls. 8, figs. 10).—This document, prepared by R. D. Robertson and S. T. Harding, reports investigations of the feasibility and economy of irrigation from reservoirs in the 18 western counties of Kansas and the 2 western counties of Oklahoma, lying west of the line of 20 in. mean annual rainfall. A general reconnaissance was made, and 5 sites, 2 of them large, were surveyed in Kansas.

It is concluded that while neither time nor funds were available for a thorough investigation of the storage possibilities of these 2 sections, such opportunities as were found for irrigation development by storage are not promis-

ing, and considered in relation to the total agricultural area the total acreage which can be supplied with water will never be more than a very small percentage of the available land. The general irregularity and torrential character of the flow of streams make it practically necessary to store on the stream beds, and with the small and unsatisfactory supplies that are found on all but 1 or 2 of the streams, proper development of sites can not be considered practical.

High-land pumping plants are being installed in the Arkansas Valley from which the annual cost of water will be in excess of \$10 per acre so that for such pumping to be profitable the best agricultural use must be made of the land. The small windmill or other pumping plant with storage reservoir or the small reservoir to store sufficient storm run-off to supply the garden products and trees is the class of irrigation development which is deemed the most promising for this area in general, although attempts to irrigate more than enough crops for home consumption by this method have not been generally successful. The most significant new development now taking place is the pumping from the underground waters on the uplands with lifts of over 100 ft.

Hydraulic laboratory for irrigation investigations, Fort Collins, Colo., V. M. CONE (*Engin. News*, 70 (1913), No. 14, pp. 662-665, figs. 5).—A description is given of the most important features of the new hydraulic laboratory, constructed under a cooperative agreement between the irrigation investigation division of this Office and the Colorado Experiment Station, for the purpose of testing and determining the accuracy of various water-measuring devices and supplying correct formulas for their use.

Report of the water rights branch of the department of lands (*Rpt. Water Rights Branch Dept. Lands, Brit. Columbia*, 1912, pp. 120, pls. 14, figs. 22).—This report contains the following articles pertaining to water supply and irrigation: Irrigation's Part in the Future Upbuilding of British Columbia, by S. Fortier (pp. 10-14); Water Legislation and Administration in British Columbia, by H. W. Grunsky (pp. 15-23); Shall Water Licenses be Perpetual? by O. C. Merrill (pp. 23, 24); Collection and Filing of Hydrographic Data, by E. Davis (pp. 25-28); Water-power Investigations in the Columbia River Drainage Basin—Progress Report, by G. G. Donald (pp. 31-40); Description of Work at Hydrographic Station near Nelson, by H. F. Meurling (pp. 41-43); Suitable Designs for Small Headgates, by F. C. Scobey (pp. 44-48); Watersheds of British Columbia—Characteristics and Possibilities, by H. W. Grunsky et al. (pp. 49-100); Forms used under the "Water Act" (pp. 100, 102); and Forms proposed by S. Fortier and H. W. Grunsky (pp. 103-105).

A study of irrigation heads in the Modesto and Turlock irrigation districts, California (*Engin. News*, 70 (1913), No. 11, pp. 502, 503).—Studies of volumes of water in second-feet delivered to each individual irrigator and of the time the head is used per acre of land were made by P. C. Berkefeldt in these districts, where alfalfa is the principal crop raised. A summary of the conclusions as to the best practice in both districts is as follows:

The strip system of checking is the cheapest and most economical of water where the topography will permit its use, otherwise a combination of square and strip checks is best. The best width of strip check is from 50 to 75 ft., the best length about 600 ft., and the best grade from 2 to 4 in. per one hundred feet. Farmer's ditches should have at least 6 ft. bottom width with gates the same width. For fairly sandy and sandy soils the use of a larger head for a shorter period of time is best for alfalfa; on the average, not less than 15 second-feet head for from 20 to 30 minutes per acre, irrigating one check at a time. For trees, vines, etc., in the same soil about 5 second-feet for an hour

per acre is best, irrigating 3 or 4 rows at once. Water should be applied directly to each check from the ditch and the water surface in the ditch should be at least 1 ft. above the highest check.

Derivation of run-off from rainfall data, J. D. JUSTIN (*Proc. Amer. Soc. Civ. Engin.*, 39 (1913), No. 6, pp. 1211-1228, pl. 1, figs. 20).—In an attempt to develop a rational method of deriving run-off from rainfall data on various watersheds the author found that on the watersheds examined the relation may be expressed by the formula $C=KR^2$, in which C is the annual run-off in inches, R the annual rainfall in inches, and K is a constant depending on the variations in the relations between rainfall and run-off from one watershed to another, depending on slope and mean annual temperature. Comparisons of numerous watersheds also indicated that the relation of run-off to rainfall may be expressed by the general formula $C=0.934 \frac{S^{0.155}}{T} R^2$, in which T is the mean

annual temperature and S the slope of the watershed (the difference between the highest and lowest elevations divided by the square root of the area).

Numerous rainfall and run-off curves and tables of data are presented to substantiate this view, and tables are given to aid in the solution of the formula. The author believes this formula to be applicable to watersheds in the eastern United States and suggests its use, in that part of the country, where run-off data are meager or lacking.

Seepage losses from earth canals, E. A. MORITZ (*Engin. News*, 70 (1913), No. 9, pp. 402-405, figs. 2).—This article considers the so-called nonpreventable losses from seepage or percolation through the bed or banks of earth canals, and presents figures said to represent the average results obtained from observations on several hundred miles of canals on 8 different reclamation projects to express the losses in terms of depth in feet in 24 hours through the wetted perimeter of the canal prism as follows: Cement gravel and hardpan with sandy loam 0.34 ft., clay and clay loam 0.41 ft., sandy loam 0.66 ft., volcanic ash 0.68 ft., volcanic ash with some sand 0.98 ft., sand and volcanic ash or clay 1.20 ft., sandy soil with some rock 1.68 ft., and sandy and gravelly soil 2.20 ft. It is concluded that the limits within which seepage losses should be considered in earth canal design may be generally defined as 0.5 ft. and 2.5 ft. per 24 hours over the wetted area of the canal.

From a mathematical consideration of seepage losses the following equation is derived: $s=0.2 c \times \frac{Q^{\frac{1}{2}}}{V^{\frac{1}{2}}}$, in which s is the seepage loss in second feet per mile of canal, Q the canal discharge, V the mean velocity of flow, and c an experimental coefficient equivalent to the depth of water in feet lost over the wetted area in 24 hours.

A diagram platted from results obtained from this equation, using values of c varying between the above prescribed limits, is given. This shows the effect of variations in velocity on these results and the advantages of using as high velocities as possible. The magnitude of the error claimed to be involved in stating the seepage loss in percentage of the flow is also illustrated.

The development of balancing devices for centrifugal pumps, A. V. MUELLER (*Engin. News*, 70 (1913), No. 11, pp. 490-494, figs. 21).—Several devices for caring for the axial thrust of the shaft in centrifugal pumps are described and their design analyzed. Both partial and complete balance devices are dealt with, and it is stated in conclusion that entirely automatic devices have the advantage over incompletely balanced devices in that they rid the pump of such members as marine thrust collars, ball bearings, etc., which are a constant source of trouble.

Construction of concrete pipe lines, B. A. ETCHEVERRY (*Jour. Electricity*, 31 (1913), No. 6, pp. 128, 129, fig. 1).—This article gives data on making, hauling, trenching for, and laying cement pipe, including tables of cost of this work on several private irrigation projects.

Large clam shell dredges; levee building methods and standards in California, F. H. TIBBETTS (*Engin. News*, 70 (1913), No. 10, pp. 456-459, figs. 8).—This article describes dredging machinery developed to meet conditions in land reclamation in California. Cross sections of levees are given and methods of flood control of the Sacramento River described.

A study of the comparative economy and convenience of steam operated and electrically operated pumping plants for drainage (*Engin. and Contract.*, 40 (1913), No. 14, pp. 371-374).—An abstract of a paper read before the fourth meeting of the Association of Drainage and Levee Districts of Illinois, which contains an argument for the use of electric power for operating drainage pumping plants and assembles and states considerable comparative data on pumping costs and efficiencies.

It is concluded, since the total cost of steam pumping in well-designed plants closely approximates \$1.25 per acre per year, that with electrical energy at 4 cts. per kilowatt hour the total cost of electric pumping does not exceed that of steam pumping, and has many advantages over other kinds of power from the standpoint of actual economy, efficiency, and convenience in operation.

Ground water movements, drainage methods, and open channel drainage, L. SCHMEER (*Engin. and Contract.*, 40 (1913), No. 13, pp. 349-353, figs. 9).—This is a study of open ditch land drainage in which the movement of water in various soils is considered and hydraulic formulas derived for estimating the probable flow from water-bearing soils into ditches, tunnels, infiltration galleries, or wells. Considerable data are given for designing drainage channels to meet various conditions of topography, rainfall, run-off, and soil porosity, and reference is made to various drainage areas.

Land drainage in Louisiana, A. M. SHAW (*Engin. News*, 70 (1913), No. 7, pp. 300-303, figs. 6).—This article describes the reclamation of timber swamps and prairies which are some distance back from the river, levee construction on trembling prairies, types of dredging plants, including dipper, orange peel, and hydraulic dredges, and the use of power plows for excavating drainage ditches.

The drainage of Lower Egypt, W. WILLCOCKS and M. V. MOSSERI (*Cairo*, 1912, pp. 11, pl. 1).—It is stated in this pamphlet that the effective drainage of Lower Egypt is impossible without pumping and that this pumping can best be done by the Government. Pumping drainage projects in this locality are described with cost data of operation.

Drainage and purification of the soil, R. GAGEY (*Bul. Dir. Gén. Agr. Com. et Colon. Tunis*, 17 (1913), No. 67, pp. 46-93, figs. 47).—This article deals with various methods of disposing of excess surface and underground water as practiced in Tunis, describes several typical drainage and land improvement projects in that country, and notes briefly the local drainage laws.

Text-book on highway engineering, A. H. BLANCHARD and H. B. DROWNE (*New York and London*, 1913, pp. XIII+762, pls. 4, figs. 233).—The authors have attempted in this work to give sufficient details to acquaint the student thoroughly with the principles and practice of modern highway engineering, and in addition to make it sufficiently broad in its scope and content with reference to materials, construction, maintenance, specifications, and cost data to serve as a comprehensive reference book upon the subject of highway engineering for the experienced engineer. The subject matter is presented under the

following chapters: Preliminary investigations; surveying and mapping; design; drainage; foundations; earth and sand-clay roads; gravel roads; broken stone roads; bituminous materials; dust prevention by the use of palliatives; bituminous surfaces; bituminous gravel and bituminous macadam pavements; bituminous concrete pavements; sheet asphalt and rock asphalt pavements; wood-block pavements; stone-block pavements; brick pavements, concrete pavements, miscellaneous roads and pavements; street cleaning and snow removal; car tracks; pipe systems; comparison of roads and pavements; sidewalks, curbs, and gutters; bridges, culverts, and guard rails; and economics, administration, and legislation.

Hard roads in Wayne County, Michigan (*Engin. Rec.*, 68 (1913), No. 13, pp. 340-342, figs. 8).—A more complete description of this work, which has been previously noted (*E. S. R.*, 27, p. 789), is given, including a note on Michigan road laws, data on concrete road specifications, and details of methods of construction.

Asphalt paving cements and road binders, J. W. HOWARD (*Engin. Rec.*, 68 (1913), No. 13, pp. 345-347).—In pointing out the necessary qualities of asphalt paving cement and road binders and describing laboratory methods for determining them, the author claims from his experience that specifications containing tests for gravity, fixed carbon, paraffin, etc., and only parts of the standard and useful tests are directly in favor of certain limited asphalt products and exclude others which may be as good or better. He advocates as the basic and essential qualities, which should be specified, the following: Adhesiveness, waterproofness, immutability, cohesiveness, ductility, flexibility, malleability, consistency at mean weather temperature, minimum susceptibility to extreme weather temperatures, purity, and freedom from injury by necessary melting heat.

Puzzolan mixtures tested for Oregon roads, E. H. McALISTER (*Cement Era*, 11 (1913), No. 10, pp. 66, 68).—Tests of various blends of Portland cement and Oregon puzzolans made by the author in an attempt to reduce the cost of concrete roads in that State indicate that a commercial product of excellent quality may be produced if puzzolan material is reground with cement 1:2 by weight. Comparative cost data show a great saving in favor of puzzolan mixtures if used on a large scale.

Road rollers in the Netherlands, L. C. STEFFELAAR ET AL. (*Internat. Assoc. Road Cong.*, III. Cong. [London], 1913, [Pub.] 73, pp. 25, figs. 10).—This pamphlet deals with road rollers and road rolling in the Netherlands, giving descriptions of a few modern horse-drawn road rollers and their accessories. These are followed by a discussion of the differences in first cost and cost of maintenance between roads which are rolled and roads not rolled, including tables of cost data from the use of horse and steam engine drawn rollers.

The advantages claimed for a modern horse-drawn roller owned by a department are as follows: It can be used in places and under conditions impossible for an engine-drawn roller, is always available at favorable periods, can be profitably used on road improvements of minor importance and on continuous maintenance of roads, and the purchase price is comparatively small. The principal disadvantages are that the road surface is injured by the horses' hoofs, the work is slower than with a traction engine, and good horses are not always available at a reasonable price.

Tests on small gasoline engines, F. M. and E. A. WHITE (*Power*, 38 (1913), No. 9, pp. 299-301, figs. 5).—Tests were made to determine the fuel consumption, in pounds per horsepower hour for varying loads, of 12 small farm internal combustion engines using gasoline as fuel. Three general classes of 4 engines each were made, ranging in power from 3 to 4½, 5 to 7, and 8 to 10 h. p. and

classified as 3, 6, and 10 h. p. sizes. With 1 exception 1 engine of each class was obtained from the same manufacturer and each engine was tested under no load, $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$, and full load.

The engine details and the test data are given in tabular form. The cost of fuel per brake horsepower was estimated on the basis of gasoline costing 16 cts. per gallon. The length of time for each test depended upon the time required to bring the fuel consumption approximately constant. At no load this occurred in about 90 minutes, at quarter load after 75 minutes, at one-half load after 60 minutes, at three-quarter load after 45 minutes, and at maximum load after 15 minutes. The fuel consumption became constant before the temperature of the jacket water.

Curves showing the fuel consumption at various loads for each class indicate that for the 3 and 5 to 7 h. p. engines the economy was greatest at the three-quarter load while for the 8 to 10 h. p. engines it was secured at the maximum loads. Curves showing total fuel, minus that at no load, indicate that up to three-quarter load the friction load of the engine is the chief factor in determining the fuel economy. The 3 and 5 to 7 h. p. classes showed that from three-quarter to maximum load other factors entered which caused a very rapid increase in the fuel consumption per horsepower hour while the 10 h. p. class showed little increase.

In determining economical sizes for given horsepowers, curves showing the fuel consumption at different loads for different cylinder displacements, which correspond to the 3, 6, and 10 h. p. classes, indicate that from 1.7 to 3 h. p. the engines having a piston displacement of 90.4 cu. ft. per minute were as economical as those having a piston displacement of 55.7 cu. ft. per minute, and that the larger displacement was more economical from 3 to 4 h. p. From 4 to 6.75 h. p. the engines having an average displacement of 90.45 cu. ft. per minute were more economical than those having a displacement of 125.4 cu. ft. per minute, but from 6.75 to 10 h. p., the larger displacement was most economical.

It is concluded that from 1 to 6.75 h. p. the engine having a displacement of 90.4 cu. ft. per minute corresponding to a rated 6 h. p. engine is, so far as economy in fuel consumption is concerned, the most desirable engine. For horsepowers above 6.75 the engine having a piston displacement of 125.4 cu. ft. or the 10 h. p. engine, would be the most desirable.

A new method of cooling gas engines, B. HOPKINSON (*Gas Engine*, 15 (1913), No. 10, pp. 568-575, figs. 2; *Power*, 38 (1913), No. 10, pp. 332-334, fig. 1).—It was found that by injecting cold water in comparatively coarse jets against the internal surface of a gas engine cylinder and the piston head the metal can be kept cool without materially cooling the gases. Other experiments showed that for practical purposes the heat flow into the barrel of the cylinder during the last three-fourths of the expansion stroke was very small compared with that in the first period, so that it was necessary only to direct the spray against the walls in the combustion chamber and the piston, the rest of the cylinder being cooled by conduction. Results of actual tests verify these claims, and it is concluded that the economy is unaffected by the use of this method of cooling since there is no apparent loss in efficiency.

A traction engine whose four wheels are driving wheels (*Engin. and Contract.*, 40 (1913), No. 7, pp. 172, 173, fig. 1).—A novel traction engine is described which has all 4 wheels the same size and each wheel carrying one-fourth the total weight of the engine. The power plant is a self-balanced 2-cylinder, 4-cycle engine. The transmission is through a pinion and large cut gear to a cast-steel gear case under the center of the frame, from which the

power is transferred by chain drive to differentials on both rear and front axles.

It is claimed that this tractor is very economical in fuel consumption and is able to operate under conditions impossible for the use of the ordinary tractor.

Trials with liquid manure spreaders, M. DALL and C. L. FEILBERG (*Tidsskr. Landökonomi*, 1912, No. 7, pp. 404-433, figs. 12).—Trials with 18 different sprinkling carts are described, and the strong and weak points of each machine are discussed.

The trials of corn and seed drills, 1912, C. P. HALL (*Jour. Roy. Agr. Soc. England*, 73 (1912), pp. 358-365, figs. 4).—The drills were tested in 2 classes: Class 1, drills for corn and pulse, and class 2, drills for grass and clover, coulter and broadcast.

Eight machines were entered in the first-class trials and thoroughly tested for ease and accuracy of adjustment, even distribution of seed, adaptability to various seeds, weight, simplicity of construction, combined with strength, number of attendants, general efficiency, and price. A 13-row and a 12-row corn and seed drill, both of the same manufacture, were awarded first and second honors, respectively.

Only one machine, which was of the same make as the winners of the first-class trials, was entered in the second-class trial. It effected such satisfactory drilling by rows and by broadcasting that it was given first honors, regardless of the absence of competition.

In these trials recent improvements of the various parts apparently displayed no great advantages. The disk type of coulter was classed as no improvement, and the old-fashioned cup feed demonstrated its superiority over all new types. The results in general indicate that the machines tested are far from perfect, and it is stated that a comparison of results obtained in these trials with similar trials held in 1874 shows little improvement and practically no alteration.

Grain cleaning contest (*Canad. Thresherman and Farmer*, 18 (1913), No. 8, pp. 39, 40, figs. 4).—Three types of grain cleaners were entered in these tests, including 8 machines, 6 of them hand driven and 2 power driven. Wheat, oats, barley, flax, and timothy were used in the tests.

Considering power acquired, capacity, design and construction, and efficiency, the highest score attained out of a possible score of 500 points was 391 points for the hand-driven machines and 411 points for the power-driven machines. Out of a total of 175 points on efficiency, including percentage of waste grain and grain grading, the same machines attained the highest score of 135 points for the hand machine and 132 points for the power machine.

Test of a feed-grinding and sifting mill, J. REZEK (*Mitt. Landw. Lehrkanz. K. K. Hochsch. Bodenkul. Wien*, 1 (1913), No. 4, pp. 558-589, pl. 1).—A brief description of the mill and its adjustable parts is followed by the results of tests.

The mill was driven by an electric motor. Barley containing 12.39 per cent moisture and weighing 70.9 kg. per hectoliter (about 55 lbs. per bushel) was ground to a fine meal at the rate of 246.3 kg. per hour, the speed being 581 r. p. m., and the necessary horsepower 3.13. Oats containing 11.88 per cent moisture and weighing 51 kg. per hectoliter was ground at the rate of 310 kg. per hour, the speed being 614 r. p. m., and the necessary horsepower 1.45. Corn containing 14.39 per cent moisture and weighing 75.8 kg. per hectoliter was ground into 3 sizes by 3 different adjustments, the first yielding coarse meal at the rate of 527.7 kg. per hour, the second a somewhat finer meal at the rate of 365.4 kg. per hour, and the third a very fine meal at the rate of 197.1 kg. per hour, at respective speeds of 618 r. p. m., 614 r. p. m., and 602 r. p. m., and respective necessary horsepowers of 1.05, 2.6, and 2.15.

The sifters were thoroughly tested in connection with the mill by grinding and sifting rye containing 13.89 per cent moisture and weighing 70.9 kg. per hectoliter. Four sifters were used in the following order: A No. 20 with 20 wires per 26 mm., 2 No. 8 with 34 wires, and a No. 9 with 38.5 wires. This test was run under 3 different adjustments and speeds, yielding flour, coarse meal, and bran in varying quantities. The results indicate that the most satisfactory speed for this purpose is between 560 and 570 r. p. m. With the same arrangement 25 kg. of hulled rye underwent a similar process for 1 hour and 14 minutes. Within 17 minutes the yield was as in the first 3 tests. After 48 minutes more, 11.68 kg. of fine medium white flour and 4.50 kg. of fine black flour had been yielded. At this point the following arrangement of sifters was substituted: A No. 18 sieve, with 18 wires per 26 mm., a No. 8, a No. 9, and a No. 5, which contained 1 wire per mm. Within 7 minutes the remainder of the rye was reduced to 1.24 kg. of fine flour, 2.13 kg. of coarse flour, 4.48 kg. of fine bran, and 0.145 kg. of coarse bran. The maximum horsepower required in this test was 3.3 and the average 1.8, and the average power consumption was 2.2 h. p. hours.

Diagrammatic plans of the mill are given with curves of the test results.

The effect of saturation on the strength of concrete, J. L. VAN ORNUM (*Proc. Amer. Soc. Civ. Engin.*, 39 (1913), No. 6, pp. 1229-1236, fig. 1).—Results of several series of tests on concrete specimens, both plain and reinforced, indicate a rapid decrease in strength for the first 2 days of submergence and a systematic increase in strength thereafter. Specimens stored for 38 days in air underwent a rapid decrease in strength when placed in water for 2 days or less but increased in strength after saturation was complete.

Test of pressure of wet concrete, E. B. GERMAIN (*Engin. News*, 70 (1913), No. 7, pp. 294, 295, figs. 2).—A recent test of the pressure of wet concrete to determine the proper figures to be used in the design of forms was made on small area columns where a high head could be produced in a short time. The apparatus used consisted of an ordinary hot-water bag filled with water, a test tube containing mercury inside the bag, and a hollow glass column running from below the surface of the mercury in the tube through a rubber stopper in the neck of the hot water bottle. Six of these bags were placed in each of 2 columns, 20 in. square and about 20 ft. high, and the mercury levels read on each after the column was filled, the difference in levels of the mercury in the test tube and in the column giving the pressure in inches of mercury.

Using a mixture of 1:1½:3, the pressure per square inch was 460 lbs. with a head of 3.08 ft., 900 lbs. for 6.08 ft., 1,330 lbs. for 9.08 ft., 1,710 lbs. for 12.08 ft., and 2,110 lbs. for 15.08 ft. With a mixture of 1:1:1 the pressure was 407 lbs. for 2.75 ft., and 840, 1,280, 1,700, 2,080, and 2,450 lbs., respectively, for heads of 5.75, 8.75, 11.75, 14.75, and 17.75 ft.

Since the first concrete put in begins to set before the last concrete is poured, the pressures in the lower part of the columns do not show quite full liquid pressure.

Tests of reinforced concrete buildings under load, A. N. TALBOT and W. A. SLATER (*Univ. Ill. Engin. Expt. Sta. Bul.* 64, 1913, pp. 104, figs. 75).—This bulletin records the results of field tests made on 3 reinforced concrete floor systems, 2 of the beam and girder type and 1 of the flat slab type. In addition is included a discussion of the method of testing, the use of the instruments, methods of observation, precautions to be taken, accuracy of results, and methods of loading.

No specific conclusions are drawn because of the wide scope of the tests.

Constructing a silo roof of concrete (*Building Age*, 35 (1913), No. 8, pp. 367, 368, figs. 4).—The construction of a conical reinforced concrete silo roof is

described in which a 1:2 sand and cement mortar is placed on expanded metal reinforcing having not less than a 3 in. mesh. A roof thickness of 2 in. is deemed sufficient for diameters of silos up to 10 or 12 ft. and 3 in. for diameters up to 20 ft. The vertical roof load is converted into tension at the circumference, which is taken care of by horizontal circular reinforcing. Tables are included for reinforcing both monolithic concrete and concrete block silos.

The pit silo for western Kansas, C. McKEE (*Agr. Ed. [Kans. Agr. Col.]*, 5 (1913), No. 14, pp. 12, figs. 2).—It is the purpose of this bulletin to point out to the dry-land farmer of limited means in western Kansas the possibilities of the pit silo and to give directions for its construction.

The essentials of a good pit silo are briefly summarized as follows: The silo must be located in firm, dry, and well-drained soil, and must have a curb extending a few inches above ground and a little below frost line. The walls should be absolutely perpendicular and smooth, plastered from $\frac{3}{4}$ to 1 in. thick, washed with a cement coat to make them air and water tight, and if they become dry before plastering they should be sprinkled lightly. A covering must be provided to keep out dirt, animals, etc., and to provide for free air circulation.

It is claimed that the pit silo is cheap, easily constructed, does not require a silage blower, and will not blow down. The silage will not freeze and will keep well if properly distributed and packed. No large cash outlay is necessary and no expensive forms are required in construction.

Farm water supplies, pumping machinery, and accessories, W. HOFFMANN (*Ztschr. Landw. Kammer Schlesien*, 17 (1913), Nos. 34, pp. 1205-1212, fig. 1; 35, pp. 1260-1265, figs. 9).—This article deals with the importance of pure water supplies for the farm and methods for obtaining it, and gives suggestions for determining the size of supply, specifications for piping and other conveying and distributing accessories, and directions for obtaining surface supplies and deep and shallow well and spring supplies. Descriptions of the construction and operation of hydraulic rams and types of small deep and shallow well pumps are given with instructions for their installation and use. In determining the size of supply it is suggested that for all purposes each person be allowed per day 20 liters, each horse 55 liters, each cow from 60 to 80 liters, each ox 70 liters, each calf 30 liters, each sheep 5 liters, and each pig from 20 to 80 liters.

Shower bath for country houses, C. Fox (*Pub. Health Rpts. [U. S.]*, 1913, Sup. 7, pp. 4, fig. 1).—A serviceable and inexpensive shower bath is described and illustrated for use in houses where there is no running water. It is made from a tin can such as is used in shipping kerosene or turpentine. The solder around the upper edges of the tin is melted off and the top removed. To the bottom are attached a stop cock and a shower head about 6 in. in diameter with very small outlet holes. The tin is lowered and raised by a rope running through a pulley attached to a rafter or other convenient support.

RURAL ECONOMICS.

A questionnaire on markets, J. W. FARLEY (*Ann. Amer. Acad. Polit. and Soc. Sci.*, 50 (1913), No. 139, pp. 139-152).—This article gives a list of 43 questions submitted to those in charge of the markets of 12 cities and summarizes their answers. The questionnaire covered the history, expense, sources of revenue, influence on producer and consumer, and other questions pertinent to city markets.

Some typical American markets.—A symposium (*Ann. Amer. Acad. Polit. and Soc. Sci.*, 50 (1913), No. 139, pp. 118-138).—This symposium comprises (1) Baltimore's Markets, by J. F. Thrift and W. T. Childs; (2) Municipal Markets

in Cleveland, by C. Kamp; (3) The Indianapolis Market, by A. Burk; (4) The Milwaukee Municipal Market, by L. Tiefenthaler; (5) Municipal Markets in Philadelphia, by A. Lippincott; and (6) The Rochester Public Market, by W. W. Merrill.

C. L. King outlines the purpose of this symposium and enumerates the principal points taken up by each of the other authors, such as the character of the market, charges, regulations, extent of use by farmers, encouragement given to farmers, effect of the market on prices, and the effect of marketing on the surrounding country. The other authors describe the conditions of the market in their city with these suggestions in mind.

Cleveland's retail markets, C. G. CARPENTER (*Agr. Student*, 20 (1913), No. 2, pp. 127-129, fig. 1).—The author describes the market conditions in Cleveland and concludes that the real value of the public market is that it furnishes a means of distributing the fresh products of the farm and garden to the most people at the lowest cost of distribution.

Car-lot markets and how they are supplied, F. ANDREWS (*Ann. Amer. Acad. Polit. and Soc. Sci.*, 50 (1913), No. 139, pp. 1-9).—The author states that the more perishable of farm products give rise to special market problems. Some of those mentioned are the size of market, the location of market places, the sources of supplies, the methods used to obtain car-lot shipments, the handling of cars in transit, and the value and difficulties of various systems of market news.

Markets for American fruit (*Spec. Cons. Rpts. [U. S.]*, 1913, No. 62, pp. 54).—This abstract contains reports from consuls located in 23 foreign countries showing market conditions, tariffs and other regulations, prices, and source of supply of fruit. These reports are taken from replies to inquiries sent out at the request of the Pacific coast fruit growers' associations.

Prevention of waste and seasonal price fluctuations through refrigeration, G. K. HOLMES (*Ann. Amer. Acad. Polit. and Soc. Sci.*, 50 (1913), No. 139, pp. 48-56).—The author gives a summary of the results and the methods used in his investigation for the U. S. Department of Agriculture of the influence of cold storage on prices. See also previous notes (E. S. R., 28, pp. 871, 872).

The motor truck as an agency in direct marketing, S. A. PHILLIPS (*Ann. Amer. Acad. Polit. and Soc. Sci.*, 50 (1913), No. 139, pp. 20-34).—The author concludes that the motor truck offers the farmer a wider sphere of activity, a choice of crops, markets, and buyers, lowers the haulage of cost, and will enable him to develop more remote and unproductive lands.

The Long Island home hamper, H. B. FULLERTON (*Ann. Amer. Acad. Polit. and Soc. Sci.*, 50 (1913), No. 139, pp. 166-170).—This article narrates the methods used to distribute market garden produce directly from the producer on Long Island to the consumer in New York City.

The cooperative lamb club as an agency for lower marketing costs, D. H. DOANE (*Ann. Amer. Acad. Polit. and Soc. Sci.*, 50 (1913), No. 139, pp. 216-222).—The author states that by forming an association at Goodlettsville, Tenn., the farmers were able to grade their lambs better and obtain a considerable advance over what they had been offered previously by local buyers.

An inquiry into agricultural credit and agricultural cooperation in Germany, J. R. CAHILL (*London: Bd. Agr. and Fisheries*, 1913, pp. XXXVI+302+226, pls. 2).—Under mortgage (long-term) credit the author describes in detail the land mortgage credit associations (*Landschaften*), state and provincial mortgage credit banks, joint stock mortgage banks, savings banks, credit for land improvement, Prussian provincial aid banks, rent charge banks, and insurance institutions and agricultural credit.

He concludes that the organization of institutional mortgage credit in Germany has been greatly facilitated by its complete system of registration of title and by the clearness of its mortgage law. Compulsory registration of title, as it exists in Germany, Austria, Hungary, and Russia, or, at least, compulsory registration of deeds (as in France, Belgium, Holland, and other European countries, as well as in America and British India), appears an indispensable prerequisite for the foundation of a system under which landowners may obtain mortgage credit on suitable terms by the issuing of land bonds which would rank as first-class securities in the general market.

Under personal (short-term) credit he discusses local cooperative banks and central cooperative banks. He considers that the growth of the personal-credit idea has been the result of necessity. Individual small farmers must rope themselves together with a more or less stable bond in order to be able to present to renters and depositors a security which the latter can accept. The highly localized character of these organizations enables the members to know the trustworthiness and the business capacity of the borrower.

The principal types of cooperative agricultural societies are discussed, and the author claims that as a result of land reform a large number of small farms came into existence. In order to hold their own with the larger farmers they were compelled to adopt modern methods of intensive farming, employ manures, buy feeding stuffs, modern implements, and machinery, obtain suitable breeding stock, and put their produce on the market in sufficient and graded quantities without the incurring of undue cost. Because of these circumstances they were compelled to unite into a local cooperative society that was binding upon the individual members only as regards the particular objects aimed at by the organization. Thus the different types of cooperative societies had their origin.

In addition, the author describes the method of audit and inspection, and gives as an appendix to his report copies of laws and documents for practically all the kinds of organizations mentioned in his detailed statement. An extensive bibliography of German works on credit and cooperation is included, also a large number of statistical tables.

Cooperative purchase and use of stallions in Denmark (*Jour. Bd. Agr. [London]*, 20 (1913), No. 7, pp. 626-628).—The procedure usually followed in Denmark by an association for the cooperative purchase and use of stallions is described here in detail, with special reference to four associations organized in 1888. The average price of the stallions runs from about £344 to £500. The Government was authorized in 1887 to make grants to horse-breeders' associations to the extent of one-half of the purchase price of a stallion, with a maximum grant per stallion of £222. In 1911 there were 267 associations receiving a total subsidy of £9,360 and owning 281 stallions. The law of 1912 reduced the state subsidy one-half, i. e., the maximum amount for each stallion is now £111.

The experience of animal insurance societies in Holland (*Jour. Bd. Agr. [London]*, 20 (1913), No. 7, pp. 628, 629).—This article presents notes and statistics illustrating the experience of animal insurances societies in Holland in 1911, and makes comparisons with the experience of similar societies in England for the same year.

Some methods of financing the farmer, G. JONES ([*Denver, Colo.*]: *Chamber Com.*, 1913, pp. 16).—The author outlines the two systems of credit found in European countries. Under short-term credit societies he gives some reasons for the low interest obtained in European countries, and suggests some modifications that would make the banking system of the United States more adaptable for this purpose. He also explains the organization of long-term mortgage associations, and considers that the most important factor for facilitating loans

on real estate in Europe is the title registration law which in effect places the Government behind the title to all property.

Rural social development (*Bul. Univ. Wis., 1913, No. 591, pp. 130, pl. 1, figs. 22*).—The discussions at this conference were under the general topics of better home conveniences, the rural church as a social center, rural social problems, country clubs, and rural social centers. Each topic was treated by three or more persons, each relating in the main his own personal experience.

The farmer's outlook, R. T. HINCKES (*London, [1913], pp. 140*).—The author concludes that the outlook for British agriculture is more promising than for many years past because of the fact that the countries which have been supplying the principal part of agricultural products to Great Britain show a decrease in their exports. He considers that this decline in exports will continue and that the increase from other countries will not be sufficient to meet the future demand, so that the demand for home produce should increase.

Agricultural statistics (*Ann. Rpt. Bur. Indus. Ontario, 1912, pp. 5-46*).—Statistics are given for the Province of Ontario for 1912 relating to the acreage, production, and value of crops, the number and value of live stock, and the number sold or slaughtered. Data are also included relating to weather conditions, the number of butter and cheese factories, and the quantity of milk used and of butter and cheese made.

Agricultural statistics of Ireland, with detailed report for the year 1912, T. BUTLER (*Dept. Agr. and Tech. Instr. Ireland, Agr. Statis. 1912, pp. XXXV+147*).—This report contains statistics concerning the size of holdings, acreage and production of crops, and acreage of pasture, grazing land, and woodland for Ireland and its minor subdivision for 1912.

The introduction contains decennial comparisons showing that between 1851 and 1912 the acreage under cereal crops decreased from 3,099,401 to 1,265,687 acres, and other green crops, including flax, from 1,513,142 to 1,077,151 acres. The acreage devoted to growing hay increased from 1,246,408 to 2,487,349 acres. The number of horses increased from 521,706 to 617,532; cattle from 2,967,461 to 4,848,498; sheep from 2,122,128 to 3,828,829; swine from 1,084,857 to 1,323,957; and poultry from 7,470,694 to 25,525,724.

The number of holdings for the same period of less than one acre increased from 37,728 to 87,451, while those of a larger acreage decreased from 691,202 to 521,345. See also a previous note (E. S. R., 27, p. 796).

Agricultural statistics of Bohemia (*Statis. Handb. Konigr. Böhmen, 2 (1913), pp. 180-233*).—Statistics relating to live stock, acreage and production of farm crops, weather conditions, and forestry are given for 1910, with similar statistics for earlier years.

AGRICULTURAL EDUCATION.

Education for farm life, S. AVERY (*Quart. Rpt. Kans. Bd. Agr., 32 (1913), No. 125, pp. 73-82*).—In this address the author reviews the progress of education in the United States with special reference to the farmer and its relation to the nation's general economic welfare. He emphasizes the importance of supplying those who are to be farmers with the kind of training that will enable them to become happy, free, and prosperous, and discusses the scope of agricultural instruction in the existing high school, the special agricultural school, and the agricultural college.

[**History and growth of the Kansas State Agricultural College**] (*Kans. Industrialist, 39 (1913), No. 33, pp. 8, figs. 17*).—An extended account of the history and growth of the Kansas College, prefaced in connection with the recent fiftieth anniversary celebration (E. S. R., 29, p. 698).

The agricultural course for women, GEORGIA E. CANTRELL (*Ann. Rpt. Missouri Bd. Agr.*, 45 (1912), pp. 584-587).—This article presents a brief summary of the agricultural course for women in the University of Missouri, with comments as to the expediency of such a course and the benefits to be derived.

The teaching of entomology in our agricultural colleges, W. LOCHHEAD (*Ann. Rpt. Ent. Soc. Ontario*, 43 (1912), pp. 38-40).—Instead of taking up the chief injurious insects by orders and keeping the relationships of the forms discussed constantly before the minds of the students, the author prefers to deal with them on a basis of their hosts during the first two years or diploma course in Canadian agricultural colleges. In the third year, in which students are preparing themselves to become investigators, teachers, etc., he advocates giving more attention to entomology as a science, this involving some familiarity with the families and chief genera. This he believes can be best acquired by practical work in the laboratory, devoting the fall term to a more detailed study of the anatomy of some typical insects and to a study of the chief families and common genera, and the winter term to a more detailed study of the economic forms. In the entomological instruction of the fourth year, taken by students who are specializing, special problems are assigned for study and discussion, and methods of work and a knowledge of the literature are emphasized. A plan of contents is suggested for a handbook on entomology.

Fit the rural school to the community, ELLEN B. McDONALD (*Business America*, 14 (1913), No. 2, pp. 164-170, figs. 5).—The author discusses the possibilities in the course of study, agriculture in rural schools, agricultural contests, and neighborhood interest.

The betterment of rural schools through agriculture: The Ohio plan, F. W. MILLER (*Addresses and Proc. Nat. Ed. Assoc.*, 50 (1912), pp. 1366-1373).—This paper briefly summarizes the circumstances leading to the passage by the Ohio legislature in 1911 of the act making the teaching of agriculture mandatory in the high and elementary schools of the rural districts and villages of the State. There is also a brief discussion of the manner in which the work has been carried on and its effect on the viewpoint of the average country boy or girl as to farm life.

Industrial education in Columbus, Ga., R. B. DANIEL (*U. S. Bur. Ed. Bul.*, 1913, No. 25, pp. 30, pls. 6).—This bulletin presents a study of the adaptation of the work of the public schools to the conditions and needs of children as being worked out in two schools in Columbus, Ga. Among the special features are the introduction of courses in normal training, home economics, and mechanic arts, industrial work for negroes, a school for children of mill operatives, and an industrial high school.

Household ethics and industrial training in the colored schools of Kentucky, C. L. TIMBERLAKE (*Ky. Dept. Ed. [Bul.]*, 6 (1913), No. 8, pp. 58, pls. 7).—The author discusses the need of instruction in household ethics and industrial training for colored youth, the duties of parents, and lessons in home making, and gives data for use in teaching home economics and agriculture in schools of different grades.

Domestic economy—the family budget, G. FLETCHER (*Dept. Agr. and Tech. Instr. Ireland Jour.*, 13 (1913), No. 4, pp. 735-739).—In this paper, read before the twelfth annual congress of the Irish Technical Instruction Association, Bangor, the author discusses the present status of home economics instruction in Ireland.

Of 112 girls' secondary schools 65 offer instruction in home economics to a total of 1,640 students, and the subject is also taught in every technical school. Outside of large centers there are over 70 itinerant teachers who give

instruction to hundreds of rural centers. The author points out the need of the further extension of this work beyond cookery, laundry work, and needle work, to include systematic instruction in the laws of health, home nursing, and first aid to the injured, and suggests that training for home duties form a part of the education of every girl, and be closely related to her means.

Manual processes of agriculture (*Rpt. Rural Ed. Conf. [Gt. Brit.], 8 (1913), pp. 27*).—As a result of its inquiry into the methods which local education authorities in Great Britain adopt with the object of promoting efficiency in the performance of manual processes, e. g., plowing, hedging, ditching, sheep shearing, milking, and basket making, the Rural Education Conference recommends that (1) instruction in certain manual processes should be provided for the older boys and girls attending elementary schools in rural districts, and that (2) local education authorities and managers of rural elementary schools should regulate the holidays so as to leave the boys free to work on the land at a time when their work is most useful.

For boys and men employed upon the land it is recommended that classes in manual processes should be conducted more in the nature of assistance to rather than formal instruction of those who attend, and the interest and sympathy of the farmers in this work should be secured. Such instruction should be more generally provided by local education authorities throughout England and Wales, and the courses at present provided in most counties should be made more thorough. Local authorities should offer certificates to be competed for by the students at the end of the class, and local societies which organize classes and competitions in manual processes should be encouraged and assisted by local education authorities, although expenditure by local education authorities on money prizes should be regulated.

The methods employed by local education authorities for giving instruction in manual processes at farm schools or agricultural colleges, by itinerant instructors, and through local agricultural societies are outlined, including the duration and subjects of instruction, competitions, and cost of instruction. In half the counties of England and Wales no provision is made by the local education authorities for instructing agricultural laborers in manual processes. Appendixes are added containing summaries of evidence as to the value of instruction in manual processes in the counties in which it is being provided and also as to the need for such instruction in counties in which no provision is made for it.

Manual instruction for adults in rural centers, H. GARRETT (*Dept. Agr. and Tech. Instr. Ireland Jour.*, 13 (1913), No. 4, pp. 748-753).—The author describes the methods now generally employed in the teaching of manual work in adult itinerant classes in Ireland, outlines briefly the ground to be covered in the teaching of constructional drawing for farmers which is an advance upon the itinerant work and forms part of a technical school course adapted to the needs of farmers, shows how the work may be arranged into a definite course, and finally indicates the direction which the teaching of construction should take.

Technical instruction in plowing, A. MURRAY (*Jour. Bd. Agr. [London]*, 20 (1913), No. 2, pp. 116-120).—An outline is given of a system of instruction in plowing which has been fostered for several years by the agricultural committee of the Hants County Council. The director of education of the county appoints the instructor and pays all expenses in connection with the classes. In one district last year there were 5 centers of such instruction with an attendance of about 60 pupils, all of whom received a minimum of 12 hours' instruction each. At the close of the instruction a plowing competition is held and prizes are awarded by the county council.

NOTES.

Missouri University and Station.—Farmers' Week at the college of agriculture, January 12-16, brought out a record attendance of 2,287, representing 19 States and 92 of the 114 counties. The enrollment in the regular short courses also set a new record of 329 students from 84 counties and from 7 States outside of Missouri.

The college has arranged a continuous series of 5-day branch short courses, beginning January 5 and continuing for 2 months. Tentative plans are also being made for holding at least two additional courses in March. Lucius F. Childers, professor of agronomy and agronomist at the Idaho University and Station during 1910-1912, has been appointed assistant professor of agronomy for extension work, particularly in connection with these branch short courses.

New Mexico College and Station.—The college is undertaking extension work through short courses for demonstrations and lectures, to be given to a limited number of counties at a nominal expense to cover some of the traveling expenses. These courses will consist of 5 consecutive meetings at a central place, probably extending over a period of 5 weeks and usually with two departments represented at each meeting.

Rupert L. Stewart has resigned as farm foreman and will specialize in farm management at Cornell University. He has been succeeded by Roland Harwell, formerly assistant in irrigation, and subsequently in commercial work.

Cornell University.—A summer term similar to the two winter terms has been established in the college of agriculture. This will extend from about June 8 to September 23 and is intended primarily for advanced undergraduates, graduate students, and instructors from this and other institutions. Its adoption allows the completion of the regular 4-year course in agriculture in 3 years.

According to the *Tribune Farmer*, the college is to cooperate with the New York Central and Hudson River Railroad Company in an agricultural consultation train over portions of its Mohawk, Ontario, St. Lawrence, and Adirondack divisions. No formal lectures will be given, but 2 cars of exhibits from the plant breeding experiments will be shown and instructors accompanying the exhibits will interpret the experiments for the use of the farmer.

Science announces that Dr. J. H. Comstock, instructor and professor of entomology for 39 years, is to retire at the close of the academic year.

Pennsylvania College and Station.—Recent appointments include Fred J. Holben as assistant chemist and E. De Turk (Purdue, 1913) as assistant agricultural chemist, vice C. A. Smith resigned to take up graduate work. J. F. Cox, instructor in soils, has resigned to become instructor in farm crops at the Michigan College.

West Virginia University and Station.—Nat T. Frame, recently county agent at Louisville, Ky., has been appointed state agent in charge of farmers' cooperative demonstration work. R. E. Hunt and I. B. Johnson, assistants in animal husbandry, have resigned, the former to become associate in animal husbandry at the Virginia College and the latter to accept an appointment as county demonstration agent in Indiana.

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EXPERIMENT STATION RECORD.

VOL. XXX.

MARCH, 1914.

No. 4.

The remarkable and world-wide increase of general interest in rural life within recent years has led to some very suggestive efforts on the part of educators and others to demonstrate ways and means by which it can be made more attractive. Many of the more pretentious of these attempts have been carried out in Europe in connection with various expositions, but some of them, although designed with special reference to European conditions, contain much that is of significance and interest elsewhere.

Particularly may this be said of the so-called "Village Moderne," which constituted an unusual feature of the International Exposition at Ghent, Belgium, in 1913, and was so successful that it deserves to be called to the attention of all who are interested in these questions. This village was a practical representation of what was regarded as a model rural community. It was designed to bring before the general public, in a comprehensive way, the organization of country life and its possibilities, and to serve as an object lesson of how the farm and village could be made more convenient, more sanitary, and more attractive.

The original conception of the "Village Moderne" is attributed to M. Paul de Vuyst, Director General of the Belgian Ministry of Agriculture and Public Works, and one of the presidents of the general committee to whom the planning and execution of the project was entrusted by the exposition officials. It was in a sense an outgrowth of some of the agricultural exhibits at earlier European expositions. Thus, in 1905, a group of Belgian agriculturists, acting under the initiative of M. de Vuyst, organized a cooperative society and constructed a set of model farm buildings at the Liège Exposition, in which emphasis was placed on such features as sanitation, the lessening of the danger from fires, modern conveniences, and proper lighting and ventilation, as well as on economy in construction. Five years later the idea was further developed along somewhat different lines at the Versailles Exposition, where a large building was constructed dealing especially with the interests of the farmer's wife, and grounds were laid out as vegetable and flower gardens, lawns, etc.

The building was fitted up in model kitchens, dairies, sleeping rooms, and the like, and was utilized for exhibits of improved housekeeping appliances and for practical demonstrations by the faculty and students of various schools of home economics.

Mention may also be made of the model farm house erected at the Dresden Exposition of Hygiene in the interests of attractive and sanitary farm dwellings at moderate cost; the so-called electrical farm at Amiens, devoted mainly to demonstrations of the application of electricity to farm life, but with some attention to improved hygienic conditions as well; the Flemish village erected at the agricultural exposition at Roubaix, depicting chiefly the laborers' cottages of the region, but with exhibits of agricultural machinery and demonstrations of home economics, blacksmithing, and dairying; and the Dutch farm at the International Exposition of Agriculture at The Hague in 1913, which was largely a portrayal of improved methods of cheese manufacture.

The "Village Moderne" at Ghent, however, was a much more comprehensive and elaborate undertaking than any of its predecessors. It extended the entire length of the exposition grounds, occupying a triangular tract of nearly eight acres. This space was utilized as completely as possible for the buildings, grounds, streets, and other equipment of a complete rural village.

The central feature of the village was the public space or common. This was tastefully constructed and contained an artistic fountain, beds of flowers, and a group of statuary symbolizing the productiveness of the soil. The principal buildings fronted on this square, notably the municipal building, or town hall, the church, the village inn, and the residence of the burgomaster, or mayor. Nearby were located the primary school, schools of agricultural mechanics and home economics, the post-office, which included the telegraph and telephone service, a tract of land reserved for out-door gatherings, a blacksmith shop, several stores, and a village creamery; while radiating from it in the usual European fashion were the buildings and grounds of various types of farms. An electric railway entering the square connected the village with the remainder of the exposition and typified its means of communication with the outside world.

Admirable and suggestive as were the conception and general plan of the village as a whole, its success in an educational way was perhaps even more largely to be attributed to the scrupulous attention given to the manifold details and special requirements. For instance, the architectural features received much attention, as it was desired to erect buildings of a type within the reach of rural communities, and which would at the same time be distinctive, attractive, and capable of blending together to form a homogeneous unit. Practical considerations also rendered it necessary that the bulk of the

space within the buildings should be available for exposition purposes, and therefore adaptable to many special needs. In the main, these varied requirements were all met, in many cases in most ingenious ways.

Thus the municipal building, designed to afford a meeting place for the local officials, was utilized as the headquarters of various Belgian officials connected with agriculture, and served to bring their activities into close touch with those in attendance. Attached was a large hall, which was used for exhibits of agricultural interest, a room which was fitted up with a collection of books and pamphlets as a village library, and quarters occupied by a fire department and a health service.

The primary school building and its equipment were designed by the exposition section on instruction, and it is said that to describe them would be merely "to codify the rules which should govern school buildings in rural communities." The plant was planned to accommodate seventy pupils, and included a school garden of one-fourth acre and several formal ornamental gardens. Movable schools of farm mechanics and home economics, such as are sent from place to place in Belgium, were also installed in the village and gave regular instruction to classes and frequent demonstrations for the general public.

Opportunity was also afforded to illustrate a number of semipublic enterprises, such as a cooperative creamery, a blacksmith shop, an inn, and a garage. These, for the most part, were fitted up by private parties, and in some cases operated as commercial undertakings, but all were required to conform to the general plan of the committee in charge.

The most important part of the rural community, however, was recognized to be neither the public buildings nor those of a semipublic nature, but the farms which constituted its very foundation, and it was their architecture and equipment which received the most careful attention. Complete sets of buildings were erected and furnished to illustrate what could be done on the large, medium, and small farm; and in addition there were structures to show the special requirements in horticulture and beekeeping, and a number of the simple cottages designed for farm laborers.

The largest farm group was erected under the direct supervision of the committee, and was planned to show an arrangement of buildings which would effect a maximum economy in manual work and yet provide a convenient and sanitary home of pleasant and attractive appearance. Its equipment was in part supplied by manufacturers, and in part by societies, the family living room, for instance, being most attractively equipped by the federation of clubs of farmers'

wives of the Province of Namur. Similar arrangements were made in the remaining farm groups, although these were on a somewhat smaller scale, one being designed for farms of about 45 acres and the other for the small holding of from 5 to 10 acres. One of the laborer's cottages was constructed and equipped by a building association in Ghent, which specializes in this type of dwelling.

A noteworthy feature in one of the farm groups was the participation of the permanent schools of home economics of Belgium. Some of these furnished the sleeping rooms, another a family collection of medicines, while others exhibited illustrative material dealing with such diverse subjects as family hygiene, floriculture, cookery, stable construction, and dressmaking. By such means, the various institutions were brought prominently before the public in a concrete and interesting way, and a powerful impetus was given to the whole propaganda for agricultural education.

Ideals of practical service and appropriateness joined with esthetic considerations of simplicity, beauty, and good taste characterized the village throughout. Owing to its ephemeral nature, its embellishment was somewhat restricted because of the obvious impossibility of obtaining the full decorative effect from slow-growing trees and shrubs; but, on the other hand, the results secured were the more useful in some ways since they revealed what could be accomplished without great delay. Floriculture was naturally especially in evidence, both in the practical gardens of the individual home and in the more formal and pretentious decorations of the public grounds and buildings. The planning, construction, and lighting of streets and driveways, the fences, and even the form and position of sign posts received the careful and sympathetic treatment typical of the entire enterprise, and contributed appreciably to its symmetry and effectiveness.

Great interest was manifested by the Belgian government in the village from its inception, and this doubtless aided its success in no small degree. The committees having the project in charge were largely composed of Belgian officials associated with agriculture or education, and the various institutions working along these lines cooperated in the enterprise in many ways. About 10,000 square feet of floor space was available in the exposition halls attached to the municipal building, and this was occupied very largely by exhibits of agricultural education, rural associations, and the like. There was also a special building, representing a hunter's lodge, for the exclusive use of the department of waters and forests, in which its various activities were depicted.

The official status of the undertaking, as well as the high regard in which the agricultural industry is regarded in Belgium, was still further attested by a visit from King Albert, who inspected the

village in detail. It is of interest to note that the King expressed himself as most heartily approving the project, and especially its esthetic phases as "a natural movement to uplift the rural population and to stimulate the mind and the heart of the tiller of the soil."

The results of an undertaking of this sort are obviously beyond exact estimation, yet it is difficult to imagine a means which could have been more effective under the conditions. Surely, if "seeing is believing," even a cursory observation of so complete and attractive a spectacle could not fail to make a deep and lasting impression upon large numbers of those who came within its borders, and its psychological influence must have been far-reaching both in time and distance.

At the close of the exposition, a complete descriptive account of nearly 250 pages and plentifully illustrated was prepared and disseminated, and a permanent national commission was organized by those in charge to further in the future the improvement of country life and the beautification of rural communities. This commission has decided to hold a congress to consider these subjects in detail and to foster and extend the awakening public interest along these lines. These measures should do much to extend and perpetuate the influence of the enterprise.

In any event, the benefits accruing should be by no means restricted to Belgium, for while many of the details are necessarily applicable to only a localized area, the fundamental conception of enhancing the attractiveness of rural life is one of world-wide significance and importance. Already, a Swiss village is announced for the national exposition to be held in Bern in 1914, in which the same general principles are to be followed, and in view of its many merits it would seem that the idea could well be considered by those in charge of expositions, state fairs, and similar enterprises elsewhere.

In the United States nothing of precisely this nature has thus far been attempted. Until quite recently, in fact, community development in this country, even in the larger cities, has been in general a somewhat haphazard and utilitarian affair, with too little attention to esthetic considerations for either the present or the future. This is not surprising, because, as compared with Europe, ours is a relatively young country with new sections still developing, with improvements not yet so permanent, and with conditions of life much less rigidly defined. Of late, however, with the passing of the pioneer stages, there have been many indications of an awakening interest in civic improvement in both city and country, and a growing realization of the opportunity for leadership in this direction.

Among the numerous forces which have been identified directly with the improvement of conditions in the open country may be

mentioned the various country life conferences and rural improvement leagues, the recently organized Collegiate Country Life Club for Rural Leadership, and similar organizations. The large amount of attention accorded in recent years to country life matters by the press, especially the magazines, and the activities of educational, religious, and social workers, all reflected in a greater interest and sympathy on the part of the general public, have also collectively exerted a considerable influence in stimulating a desire for rural betterment.

Various special factors, both internal and external, have likewise been at work in many towns and villages, often leading to the formation of village improvement societies or the attempting of similar functions by the grange, church societies, or other local organizations. In the upbuilding of some of the newer sections of the country, the value of well-planned and attractive streets and public buildings as an aid to growth and development has been appreciated from the start by some of their promoters, and where this is true it is resulting in an increasing number of communities of considerable individuality and great charm. Similarly, many of the railway systems have recognized the advantages to all from the enhancing of the appearance of the communities traversed by their lines, and have endeavored to further their development by encouraging their local officials through prizes and otherwise to beautify the grounds around their stations and elsewhere along their rights of way, and in some cases by cooperating with municipalities, boards of trade, and the like in a general campaign of beautification.

Now that this interest has been so generally awakened in one way or another, the urgent need is for trained leadership, and especially of expert advisers capable of formulating a sane and yet comprehensive program. The lack of a suitable plan, with provisions for the future as well as for the present, is coming to be realized as one of the most serious handicaps in improvement work to-day, and one which is by no means confined to rural villages. Many of the agricultural colleges, for instance, are contemplating somewhat ruefully the consequences of their own lack of foresight, and are attempting with considerable expense and difficulty to overcome as far as is now possible the disadvantages they are under, because of having had no adequate plan for their buildings and grounds in the earlier days.

Fortunately, in many of the older parts of this country, notably in New England, the generous commons and broad streets provide an excellent foundation for landscape work, while the very lack of development in the newer sections makes them at least an unspoiled field for future progress. In any case, however, there is need for a definite plan of development, and the value of this plan will be much

increased if it can be prepared by some agency of recognized ability and authority.

Such assistance may appropriately be expected of the various agricultural colleges and it is of interest to note that several of them are already embracing the opportunity. The rural surveys of the universities of Wisconsin, Minnesota, and other States may be mentioned as a useful preliminary step in this direction, as is also a recent bulletin issued by the Wisconsin Station on rural social centers, in which the workings of the rural school, the rural club, the rural church, and the rural municipal center along this line are presented and discussed.

As another instance may be cited the campaign of the New York State College of Agriculture, which, it will be recalled, exhibited at the Fifth National Corn Exposition in 1913 a most suggestive model of a plan for a rural community center. This plan was proposed as a modification of the usual county fair, with a view to eliminating its objectionable features while retaining those which are desirable, and adding new elements which would permit of the plant being utilized throughout the year. Its distinctive features included the use of a tract of land from twenty to thirty acres in extent, in part laid out much as the usual fair grounds, but containing in addition a building available for year-round meetings and exhibits, a grove for picnics and similar gatherings, an athletic field, a consolidated school with gardens, and a considerable area for demonstration plats.

Such a center, it is readily seen, could be made most useful as well as attractive. The entire project need not be carried to completion immediately, but a fundamental requisite to its success is the securing of a suitable tract of land, and usually this may be obtained most easily in the earlier stages of settlement. As a step in this direction may be mentioned the bill passed by the United States Senate in February, under which the Secretary of the Interior is authorized to withdraw from entry suitable tracts on the various reclamation projects in Montana, not to exceed twenty acres in any one township, for the use of residents as country parks, public playgrounds, and community centers.

A number of the agricultural colleges have evinced their interest in rural community improvement through their departments of landscape gardening, and some of these are offering courses with this end in view. Thus, at the Massachusetts Agricultural College there is a course in civic art which includes work in city, village, and rural improvement. As a practical exercise along this line the students recently prepared a working plan for a contemplated project of street improvement in a large nearby city, thereby receiving considerable commendation for themselves and the institution from a com-

munity which had hitherto found little in the work of the college of direct application to its particular needs. The same college has also provided a special extension instructor in civic betterment, working in connection with the landscape gardening department, to give assistance in rural and village improvement enterprises, such as the planting and care of shade and street trees, the planning of playgrounds, cemeteries, and picnic grounds, the beautifying of water fronts, and the arrangement and development of town commons. It is anticipated that much of this work will be conducted in cooperation with local granges, men's and women's clubs, village improvement societies, and similar organizations.

The criticism is sometimes expressed that the agricultural colleges have been too largely concerned with the material problems of farm life, and however this may be, it is certain that they have a legitimate field for leadership through the social forces at work under rural conditions. As Dean Russell of Wisconsin has said, "the problems of agriculture are so intimately and inextricably bound up with those of country life in general that it is well nigh impossible to separate them. In its last analysis, all of the questions that concern us relative to crop production and utilization are only incidental to the more fundamental inquiries regarding country living, for the farm is not only a place of business but a home." If the colleges in addition to increasing the farmer's income can add to the richness and attractiveness of rural life they will have demonstrated anew their right to a position of rural leadership.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

Treatise on general and industrial inorganic chemistry, E. MOLINARI, trans. by E. FEILMANN (*Philadelphia, 1912, 3. ed., rev. and enl., pp. XVI+704, pls. 3, figs. 280*).—The first part of this third edition deals with general chemistry, the second with the nonmetals, and the third with metals, with an appendix which deals with the treatment of water for industrial purposes. The book is plentifully illustrated with cuts and drawings, and discusses many subjects, such as the fixation of atmospheric nitrogen, of interest to the agricultural chemist.

General and industrial organic chemistry, E. MOLINARI, trans. by T. H. POPE (*Philadelphia, 1913, 2. ed., rev. and enl., pp. XIX+770, figs. 506*).—A number of alterations have been made in this English edition, consisting chiefly in amplifications of the statistical data referring to Great Britain and the United States. The first part of the book deals with the general chemistry of organic compounds, while the second portion considers the derivatives of methane and includes the chemotechnical processes concerned in the petroleum industry, the manufacture of alcohol and alcoholic beverages, the preparation of waxes, soap, and sugar, the tartar industry, animal oils and fats, etc. The products belonging to the cyclic compounds are also given consideration.

Allen's commercial organic analysis, edited by H. LEFFMANN, W. A. DAVIS, and S. S. SADTLER (*Philadelphia, 4. ed., vols. 2, 1910, pp. X+520, figs. 14; 3, 1910, pp. X+635, figs. 25; 4, 1911, pp. VIII+466, figs. 7; 5, 1911, pp. IX+704, figs. 8; 7, 1913, pp. IX+563, figs. 29; 8, 1913, pp. X+696, figs. 60*).—This is a new edition of this well-known work, the first and sixth volumes of which have been previously noted (*E. S. R.*, 22, p. 508; 27, p. 806). The topics dealt with are as follows: Volume 2, fixed oils, fats and waxes, soap, glycerol, wool fat; volume 3, hydrocarbons, asphalt, phenols, aromatic acids, modern explosives; volume 4, resins, rubber, gutta-percha, essential oils; volume 5, tannins, dyes and coloring matters, inks; volume 7, alkaloids, animal bases and acids, glucosids, cyanogen; and volume 8, enzymes, proteins, milk, meat, hemoglobin, proteoids, fibroids.

Practical agricultural chemistry, S. J. M. AULD and D. R. EDWARDS-KER (*London, 1913, pp. XXIV+243, pls. 5, figs. 28*).—This book is intended, according to the preface, as an aid to those students working through courses of instruction for the purpose of obtaining the bachelor of science degree of the University of London. Quantitative analytical methods are introduced throughout the work, largely as a means of interpreting principles or expressing ideas and not as an end in themselves. In the work prescribed a knowledge of the more common qualitative and quantitative processes of general chemistry is taken for granted.

Yearly report in regard to the progress made in agricultural chemistry, edited by T. DIETRICH (*Jahresber. Agr. Chem., 3. ser., 15 (1912), pp. XXX+*

555).—This is the report for the year 1912 in continuation of that previously noted (E. S. R., 28, p. 616).

The chemistry of plant and animal life, H. SNYDER (*New York, 1913, 3. rev. ed., pp. XXII+388, pls. 3, figs. 101*).—The third revised edition of this work, in which an attempt has been made to obtain a sharper division between the first part, dealing with the elementary principles of chemistry from an agricultural viewpoint, and the second section, which treats more distinctively of the chemistry of plant and animal life.

Biochemistry of plants, F. CZAPEK (*Biochemie der Pflanzen. Jena, 1913, vol. 1, 2. rev. ed., pp. XIX+828 figs. 9*).—This, the second revised edition, has been amplified. Its contents include a historical introduction, general biochemistry, special biochemistry of plants, and the lipoids in the plant metabolism.

Micro-chemistry of plants, H. MOLISCH (*Mikrochemie der Pflanze. Jena, 1913, pp. IX+395, figs. 116*).—This publication is divided into a general and a special part. The former deals with methods, apparatus, and general considerations, while the special part is subdivided into an inorganic and organic division. The inorganic portion deals with the cations (iron, aluminum, manganese, calcium, magnesium, potassium, sodium, and ammonium), the anions (sulphates, nitrates, phosphates, carbonates, silicates, chlorine, and iodine), and oxygen. The organic portion deals with the fatty series, the aromatic series (which includes phenols, aldehydes, quinones, terpenes, resins, tannins, glucosids, and coloring matters), the cell membranes, and the inclosures of the nucleus, plasma, and cellular fluid. The book contains a comprehensive bibliography.

Osmotic pressure, A. FINDLAY (*New York, London, and Bombay, 1913, pp. VI+84, pls. 2*).—The contents of this book, which is one of a series of monographs on inorganic and physical chemistry, are as follows: Semipermeable membranes and osmotic pressure; van't Hoff's theory of dilute solutions; direct determination of the osmotic pressure of concentrated solutions; discussion of the recent determinations of osmotic pressure, and of the van't Hoff theory; the general theory of ideal solutions; discussion of the osmotic pressure of aqueous solutions of cane sugar in the light of the theory of ideal solutions; indirect determination of the osmotic pressure; and views regarding the cause of osmosis and the action of the semipermeable membrane. A bibliography embracing 137 titles is appended.

Solvents, oils, gums, waxes, and allied substances, F. S. HYDE (*New York, 1913, pp. VI+176*).—This book consists of a series of notes for the use of factory chemists and those who desire a short reference work on commercial organic products. It includes tests which have been found reliable in the hands of the author. Its contents are as follows: Various solvents and fluids; terpene bodies, camphors, essential oils, fragrant substances, and balsams; true gums, gum resins, and bitumens; carbohydrates; albuminoids and proteids; oils, fats, and waxes; a list of commercial tests on oils and fats; lubricating oils; linseed oil; insoluble soaps; fatty acids; alkaloidal substances; bitter principles; and miscellaneous substances.

The volatile oils, E. GILDEMEISTER and F. HOFFMANN (*Die Ätherischen Öle. Leipzig, 1913, vol. 2, 2. ed., pp. XVIII+713, pls. 5, figs. 53*).—This is the second edition of the second volume of this work, and has been edited by E. Gildemeister. The first volume has been previously noted (E. S. R., 25, p. 113).

Biology of fat decomposition, A. SPIECKERMANN (*Festschrift 84. Versamml. Deut. Naturf. u. Ärzte von der Med. Naturw. Gesell. Münster, 1912, pp. 94-111*).—A review of the work of this author with reference to the decomposition

of fat by *Penicillium glaucum*. The subject is considered under the following headings: The taking up of fatty acids and glycerol by the cells of the fungus; the cleavage of glycerol; the cleavage of fatty acids; assimilability of fatty acids and molecular synthesis; and the changes produced in the constants of fat through the agency of molds.

The tannins, J. DEKKER (*Die Gerbstoffe*. Berlin, 1913, pp. XIII+636, figs. 3).—This is a large botanical-chemical monograph on the tannins. The first part of the book (pp. 1-292) deals with the literature pertaining to the tannins, and tannin substances and their botany, considered from the standpoint of physiology. The occurrence and significance of the tannins, etc., are discussed.

The second part of the book (pp. 295-586) considers the subjects under the following headings: Tannin and the tannoids; substances from which tannins originate; chemical classification, definitions, reactions, and properties; quantitative analysis; and the use of tannins in the arts, sciences, and industries.

Investigations about chlorophyll, R. WILLSTÄTTER and A. STOLL (*Untersuchungen über Chlorophyll*. Berlin, 1913, pp. VIII+424, pls. 11, figs. 16).—This work comprises unpublished investigations which have been conducted during the last years by the authors and deals with methods and results. It discusses the subject under 3 headings, namely, the isolation of chlorophyll, the separation and quantitative determination of all the components of the coloring matter of leaves, and the hydrolysis of chlorophyll. A large bibliography is included.

Principles of ferment methods, J. WOHLGEMUTH (*Grundriss der Fermentmethoden*. Berlin, 1913, pp. IX+355).—A text-book on the subject designed for physicians, chemists, and botanists, and divided into a general and special part. The general part deals with the nature and properties of ferments or enzymes, the general principles involved in enzym investigations, the preparation of solutions of ferments and the isolation of ferments, and a chapter on filtration and dialysis. The special part considers carbohydrate-splitting ferments (ferments cleaving polysaccharids, trisaccharids, disaccharids, and detection of monosaccharid-splitting ferments); fat-splitting ferments (lipases and esterases); protein-splitting ferments; ferments cleaving nuclein and nuclein bases; oxidases; catalase; and coagulation of the blood.

The reversibility of ferment action, E. BOURQUELOT (*Rev. Gén. Sci.*, 24 (1913), No. 18, pp. 687-693, fig. 1).—A discussion of this topic, with special reference to the work of the author and his coworkers. The significance of the reversibility of ferment action for chemistry and physiology is pointed out.

Action of sucrase from koji in the presence of various acids, G. BERTRAND and FRAU ROSENBLATT (*Abs. in Chem. Ztg.*, 37 (1913), No. 36, p. 366).—Sucrase obtained from koji shows its greatest activity in those solutions in which the hydrogen ion concentration of the solution corresponds to the neutral point of helianthin.

Action of hydrogen peroxid upon the amylase of woman's milk, L. LAGANE (*Compt. Rend. Acad. Sci. [Paris]*, 156 (1913), No. 25, pp. 1941-1943).—The addition of hydrogen peroxid in small amounts to raw human milk accelerates the starch liquefying power and to a lesser extent increases the saccharifying power of amylase.

The significance of hydrogen ions for the rennet and acid coagulation of milk, O. ALLEMANN (*Biochem. Ztschr.*, 45 (1912), No. 3-4, pp. 346-358; *abs. in Chem. Ztg.*, 36 (1912), No. 88, p. 841).—The procedure followed was Van Dam's (*E. S. R.*, 20, p. 1178), but as the results obtained with milks having additions of acids were unsatisfactory, it was necessary to add to the milk a reaction regulator which consisted of sodium acetate-acetic acid mixtures of different

hydrogen ion concentration. The time of coagulation was noted in these mixtures, and in this way was shown to be directly proportional to the concentration of the hydrogen ions.

In adding the acetate-acetic acid mixture a zonal change in the milk was noticeable, and simultaneously, a change in the surface tension. Up to a hydrogen ion concentration of 0.56×10^{-5} no change in the mixture was noticeable, but from 0.64×10^{-5} to 1.29×10^{-5} a diffuse clouding was seen, and at 1.29×10^{-5} the casein was precipitated.

From this it was concluded that the coagulation of milk through acid is a function of the actual hydrogen ions. The fact that casein is precipitated from milk at 1.29×10^{-5} led the author to believe that the reason purified casein is only precipitated at 2×10^{-5} is because during the process of purification some changes in its make-up take place.

Two processes, i. e., the forebreak and the separation of the curd, which occur in the manufacture of Emmental cheese, could be explained by some of the findings with the acetate-acetic acid mixture. Both are dependent upon an optimum of hydrogen ion concentration; that for the forebreak is 0.45×10^{-5} , and that for the separation is 1.8×10^{-5} .

The effect of the salts of the rare earths upon the coagulation of milk by rennet, A. FROUIN and V. MERCIER (*Compt. Rend. Soc. Biol. [Paris]*, 74 (1913), No. 17, pp. 990, 991; *abs. in Internat. Inst. Agr. [Rome]*, Mo. Bul. Agr. Intel. and Plant Diseases, 4 (1913), No. 7, p. 1099).—The metals studied were in the form of sulphates of cerium, lanthanum, neodymium, praseodymium, samarium, and thorium. The results showed that coagulation of milk is hastened by the presence of these salts.

Does milk contain phosphatids? V. NJEGOVAN (*Biochem. Ztschr.*, 54 (1913), No. 1-2, pp. 78-82).—In this investigation the sodium sulphate method (E. S. R., 28, p. 610) was used.

As a result the author asks whether we are justified in believing that milk contains phosphatids. The small traces of phosphorus which are obtained by the alcoholic extraction undoubtedly can be attributed to the presence of decomposition products of casein. This is demonstrated by the fact that repeated extraction of casein always yields phosphorus in the extracts.

Casein (Merck) prepared according to Hammarsten's method is slightly soluble in hot absolute alcohol and the alcoholic solution on evaporation yields phosphorus. The small amounts of phosphorus noted in the ether and chloroform extracts are due to the fact that these solutions contain particles of insoluble substances which do not filter out. Sodium sulphate is said not to affect the solubility of phosphatids.

The dominance of Roquefort mold in cheese, C. THOM and J. N. CURRIE (*Jour. Biol. Chem.*, 15 (1913), No. 2, pp. 249-258, figs. 2).—The purpose of this investigation was to obtain information relating to the gases within Roquefort cheese and their relation to the growth of *Penicillium roqueforti*.

An "analysis of the gas collected from the air spaces in Roquefort cheese (both imported and made experimentally) shows that the percentage of free oxygen is low, in no case among those tabulated rising above 7 per cent. Carbon dioxide appears in proportions ranging from 21 to 40 per cent. The percentage of carbon dioxide is highest in comparatively fresh-made cheese, where it arises both from respiration of the micro-organisms present and as a by-product of the decomposition of lactose by bacteria. From the maximum figure the percentage falls slowly by diffusion. No hydrocarbons were found. Hydrogen, if present, was in very small amount.

"Cultures of 22 species of *Penicillium* and 5 species of *Aspergillus* grown in a Novy culture jar for 19 days produced an atmosphere containing approxi-

mately 25 per cent of carbon dioxid. Cultures of the same species in the same jar with an initial mixture of air and 25 per cent of carbon dioxid showed 37 per cent of carbon dioxid at the end of 8 days, with marked reduction in the activity of certain species. Cultures of the same series of fungi in jars with approximately 50 per cent of carbon dioxid in the initial mixture left the mixture approximately unchanged at the end of 7 days. Fungus growth was stopped for certain species, greatly reduced for all, but 6 of the species tested produced very considerable growth.

"Cultures of this series of species grown for 8 days in jars with 75 per cent of carbon dioxid in the initial mixture showed that *P. roqueforti* alone was able to produce fairly strong colonies in this mixture. A mixture of 75 per cent of carbon dioxid with air gives approximately 5 per cent of free oxygen. The close correspondence between the results of gas analysis and comparative culture indicates that the low percentage of oxygen in the open spaces within the cheese accounts for the dominant activity of *P. roqueforti* in Roquefort and related types of cheese."

Report of the progress made in the field of milk chemistry and dairying during the second half of 1912, W. GRIMMER (*Milchw. Zentbl.*, 42 (1913), Nos. 5, pp. 139-144; 6, pp. 178-185).—This deals with the literature on milk production, milks of various kinds, milk constituents, changes in milk and its constituents, bacteria in milk, milk enzymes, immune bodies and milk as an antigen, rennet and coagulation by rennet, milk as a food, milk products, dairy machinery, milk supply, and methods for examining milk.

The chemistry of rubber, B. D. PORRITT (*London*, 1913, pp. VII+96).—This monograph is said to be a concise presentation of the chemistry of rubber. Its contents are as follows: The properties of crude rubber; constitution and derivatives; methods of vulcanization; theories of vulcanization; waste rubber and its utilization; and synthetic caoutchouc. A bibliography of 179 titles is appended.

About the use of red cabbage extract as an indicator for the colorimetric measurement of the hydrogen ion concentration, L. E. WALBUM (*Biochem. Ztschr.*, 48 (1913), No. 4, pp. 291-296; *Compt. Rend. Lab. Carlsberg*, 10 (1913), No. 2, pp. 227-232).—The red coloring matter of red cabbage was found to serve well as an indicator for measuring the hydrogen ion concentration, and the figures obtained agreed fairly well with those given by the electrometric method. The indicator worked well in the presence of an appreciable amount of proteins. Neutral salts (up to $\frac{1}{2}$ molecule of sodium chlorid), toluene, and chloroform did not affect the results of the measurements.

The separation of δ -alanin and δ -valin, P. A. LEVENE and D. D. VAN SLYKE (*Jour. Biol. Chem.*, 16 (1913), No. 1, pp. 103-120).—" δ -Alanin combines with phosphotungstic acid in the ratio of approximately 1:14 by weight, forming a crystalline salt. At 0°, in a solution containing, per 100 cc., 20 gm. or more of phosphotungstic acid in excess of the amount combining with the alanin, and 10 gm. of sulphuric acid, the solubility of alanin is only 0.15 gm. per 100 cc. The solubility of δ -valin under the same conditions is 1.21 gm. per 100 cc. By alternate crystallization of valin as the free amino acid and of alanin as the phosphotungstate, one can effect a practically quantitative separation of a mixture of the 2 amino acids."

Examination of hydrocarbon oils and fats, D. HOLDE (*Untersuchung der Kohlenwasserstofföle und Fette sowie der ihnen verwandten Stoffe*. Berlin, 1913, 4. ed., rev. and enl., pp. XVI+596, pls. 2, figs. 115).—This edition includes the examination of vegetable and animal fats and oils. In addition it takes up some of the commodities which are made from fats and oils such as candles,

hardened oils, soaps, soap powder, glycerin, wool oils, turkey-red oil, linseed-oil varnishes, oil colors, linoleum, etc.

New viewpoints for the analysis of oils and fats, A. BÖMER (*Festschrift 84. Versamml. Deut. Naturf. u. Ärzte von der Med. Naturw. Gesell. Münster, 1912*, pp. 87-93).—This discusses the value of the different criterions which have been utilized for the judgment of fats and oils. The influence on the composition of the body and milk fats of feeding certain substances, and the determination of various specific fats in admixture with other fats, are also considered.

Yearly report in regard to the progress made in the examination of foods and condiments, H. BECKURTS, H. FRERICHs, and R. BOHLMANN (*Jahresber. Untersuch. Nahr. u. Genussmtl.*, 22 (1912), pp. 176).—This report, which constitutes a review of the literature appearing during the year 1912 on food and condiment chemistry, is divided into a general and special part and an appendix dealing with toxicological chemistry. For the previous report see another note (E. S. R., 29, p. 506).

The differentiation by biological means of Indian buffalo meat and beef, F. SCHADAUER (*Ztschr. Fleisch u. Milchw. Hyg.*, 23 (1913), Nos. 18, pp. 409-416; 19, pp. 437-442).—According to the author's investigations, it is possible to distinguish between the two sorts of meat by means of the precipitin reaction.

A rapid and easy formula for calculating the fat-free dry substance in milk, H. M. HÖYBERG (*Ztschr. Fleisch u. Milchw. Hyg.*, 23 (1913), No. 23, pp. 539-541).—Fleischmann's formula is considered cumbersome and Ackermann's calculator is tiresome to the eye. The author proposes the following formula for this

purpose: Fat-free solids = $\frac{v+f}{4}$, v representing the specific gravity minus 1, multiplied by 1,000, and f the percentage of fat contained in the milk; e. g., in a milk having a specific gravity of 1.034 and containing 2.8 per cent of fat $\frac{34+2.8=}{4}$ 9.2 per cent.

The formula was tried with 24 samples of suspicious milks and 20 samples of normal milk and apparently gave good results.

Estimation of lactose in milk, R. SANFELICI (*Staz. Sper. Agr. Ital.*, 45 (1912), No. 12, pp. 908-916).—In a comparative study between Fehling's and Pavy's methods for determining lactose in milk serum, the figures obtained with the Pavy method were from 0.2 to 0.25 per cent the higher. The Pavy method has several advantages over the Fehling method and is deemed sufficiently exact for estimating lactose in milk.

Determination of fat in dried milk, RUSCHE (*Molk. Ztg. [Hildesheim]*, 27 (1913), No. 50, pp. 977, 978).—Milk powders made by the Hatmaker process when fresh gave good results with the Teichert, Hesse, Siegfeld, Burr, and other methods, but with old powders the figures obtained were inaccurate. Therefore the necessity for a method for this class of goods became apparent and the following was devised:

In the usual Gerber butyrometer place in layers 10 cc. of sulphuric acid (specific gravity 1.82), 5 cc. of water, and 1 cc. of alcohol; then weigh off 1.133 gm. of milk powder in a specially devised weighing funnel provided with rubber stoppers, add powder to the mixture in the butyrometer, and finally add 5 cc. of water. After shaking thoroughly place the butyrometer in a water bath having a temperature of from 65 to 70° C., then shake here and there until the solution has become clear; centrifuge the butyrometer with its contents for 15 minutes, place it in the water bath again, and read off the height of the fat column. The results multiplied by 10 give the percentage of fat in the milk powder.

The figures obtained by the method are deemed satisfactory and no plug formation or similar condition takes place.

A handbook of sugar analysis, C. A. BROWNE (*New York and London, 1912, pp. XI+787+[280], figs. 200*).—This is a practical and descriptive treatise on the subject of sugar analysis and is meant for use in research, technical, and control laboratories. The contents of part 1, which deals with physical and chemical methods of sugar analysis, are as follows: Sampling of sugar and sugar products; densimetric methods of analysis; principle and uses of the refractometer; polarized light, theory, and description of polarimeters; theory and description of saccharimeters; polariscope accessories; specific rotation of sugars; methods of simple and of invert or double polarization; special methods of saccharimetry; miscellaneous physical methods as applied to the examination of sugars; qualitative methods for the identification of sugars; reduction methods for determining sugars; special quantitative methods; and combined methods and the analysis of sugar mixtures.

The contents of part 2, which deals with the occurrence, methods of preparation, properties, and principal reactions of the sugars and allied derivatives are as follows: Classification of the sugars and their formation in nature; the monosaccharids; the disaccharids; the trisaccharids and tetrasaccharids; the amino sugars and the cyclases; and the sugar tables are appended.

A number of sugar tables are appended.

Quantitative determination of reducing sugars by Lehmann's method, L. GRIMBERT (*Bul. Soc. Chim. France, 4. ser., 18 (1913), No. 3, pp. 117-120; noted in Chem. Ztg., 37 (1913), No. 33, p. 334*).—The author states that excellent results may be obtained if a sufficient amount, but not an excess, of dilute acid is used in the method, and if the liberated iodine is titrated indirectly by adding an excess of sodium hyposulphate and then titrating back with iodine.

The estimation of methyl alcohol in spirits, etc., J. HETPER (*Ztschr. Untersuch. Nahr. u. Genussmit., 24 (1912), No. 12, pp. 731-737; abs. in Chem. Ztg., 37 (1913), No. 35, Repert., p. 163*).—In this method it is first necessary to take the specific gravity of the distillate obtained from the solutions made acid and alkaline in order to determine their total alcohol content. With an alcohol content of 45 to 55 per cent by weight, according to the table which accompanies the article, the specific gravity of ethyl and methyl alcohol shows very little difference. The distillate is then diluted to from 0.91 to 0.915, and a definite amount of potassium permanganate solution containing phosphoric acid is added whereby the methyl alcohol is converted into carbon dioxide and the ethyl alcohol is oxidized into acetic acid. One gm. of methyl alcohol requires 187.5 cc. of normal potassium permanganate solution and ethyl alcohol only 87 cc.

The other volatile substances present in spirituous liquors, with the exception of furfural and ethyl ether, have no marked effect upon the results.

About the analytical estimation and technical preparation of cellulose, J. KÖNIG (*Festschrift 84. Versamml. Deut. Naturf. u. Ärzte von der Med. Naturw. Gesell. Münster, 1912, pp. 78-86*).—This article deals with the various kinds of cellulose, the different methods for determining cellulose, the factors which interfere with the results obtained in the analyses, and the present-day methods for obtaining pure cellulose from different sources. In addition to this the use of cellulose as a feeding stuff, for paper making, and for alcohol manufacture is considered.

Estimation of cellulose in woods and textile fibers, J. KÖNIG and F. HÜHN (*Ztschr. Farb. Indus., 11 (1912), No. 14, pp. 209-211; abs. in Chem. Zentbl., 1912, II, No. 12, pp. 1066, 1067; Analyst, 37 (1912), No. 440, pp. 510, 511*).—This is a reply to the abstract previously noted (E. S. R., 28, p. 805), in which it is maintained that Cross and Bevan have not shown conclusively that

chlorination is unaccompanied by oxidation. Furfural-yielding groups are synonymous with pentosans, according to Tollens, and these groups must first be removed by drastic hydrolysis before the cellulose can be considered pure.

"The maximum specific rotation of solutions of cellulose in acid zinc chlorid was not put forward as a test for pure cellulose, but the fact was merely recorded that the solutions which showed the maximum rotations were derived from celluloses which, by other characters, were proved to be the purest. [The authors] found by their proposed method, in a sample of commercial sulphite wood cellulose, only 32.21 per cent of 'true cellulose;' this result is upheld against the criticism of Cross and Bevan on the ground that the sample still contained much lignin. The differences between the authors and Cross and Bevan turn on the question of a definition of chemically pure cellulose, as contrasted with the technically pure article. König and Braun, by the isolation of lignin, free from accompanying cellulose, but still retaining the structural form of the cell membrane, have proved that the lignocellulose of wood is not a chemical combination, but a mixture of two mutually interpenetrating colloids."

Home manufacture of cider vinegar, L. L. VAN SLYKE (*Better Fruit*, 7 (1913), No. 11, pp. 7-10).—Previously noted from another source (*E. S. R.*, 22, p. 416).

Grape juice, F. T. BIOLETTI (*California Sta. Circ.* 108, pp. 12, fig. 1).—This is a short account of methods for preparing and preserving unfermented grape juice, with "enough detail to enable anybody to devise means to conserve small quantities for domestic use, or to judge of the efficacy of industrial methods or installations."

The varieties of grapes deemed best suited for making grape juice are those which show a high acidity when ripe, although any grape making a good wine will make a good grape juice. The best grape juice is made from mature grapes in perfect condition, but with the proper methods of handling table-grape culls may be used for this purpose. When grapes low in acidity are to be employed, especially those which are very sweet, a little citric acid may be added to the juice, or it may be blended with that of acid varieties.

Typical analyses of some Californian grapes considered suitable for grape juice are reported in tabular form. The best stage to gather Muscat grapes was when the sugar had risen to 25.5° Balling. "As a general rule, the grapes for flavoring should be gathered when the sugar reaches 23 to 25° and the grapes for acidity when it reaches 19 to 21°."

Utilization of juice from waste oranges, W. V. CRUESS (*Cal. Cult.*, 41 (1913), No. 13, pp. 304, 305, 323, figs. 2).—This article gives directions for making unfermented orange juice from frozen or cull oranges. From 100 parts of sound cull oranges 23.1 parts of juice were obtained, or 55.4 gal. of juice per ton of fruit. Frozen oranges yielded from 42.5 to 45 gal. per ton of fruit.

The methods of crushing and pressing the oranges and defecating, filtering, pasteurizing, storing, and bottling the juice are described. The filtering apparatus and a homemade pasteurizer are illustrated.

Formulas for preserving and processing fruits, vegetables, etc., for exhibition purposes, J. H. PAGE (*Bur. Mines, Manfrs. and Agr. [Ark. Pub.]*, 1913, pp. 11).—Directions and formulas are given.

Bacon curing on the farm, J. C. NEWSHAM (*Jour. Bd. Agr. [London]*, 20 (1913), No. 6, pp. 478-487).—A detailed description of the cottager methods of curing bacons and hams in vogue in the British Isles, including the Hampshire, Yorkshire, Buckinghamshire, Cumberland, Scotch, and Irish methods and recipes for curing.

Industrial utilization of zein, the protein of maize, J. J. GEISTDORFER (*French Patent* 446,840, Aug. 2, 1912; *abs. in Chem. Ztg.*, 37 (1913), No. 35,

Report., p. 168).—Zein is proposed as an electrical insulating material and for the impregnation of paper for the manufacture of isolating sheets. When mixed with kaolin and sulphur it yields a plastic substance which can be pressed hydraulically.

Proceedings of the twenty-ninth annual convention of the Association of Official Agricultural Chemists, edited by W. D. BIGELOW and G. O. SAVAGE (*U. S. Dept. Agr., Bur. Chem. Bul.* 162, pp. 232, pls. 2).—This is the official report of these proceedings, which have been previously noted (*E. S. R.*, 27, p. 495).

METEOROLOGY—WATER.

Agricultural zones of the Tropics in their relation to climate.—I. America, R. HENNIG (*Tropenpflanzer, Beihefte*, 14 (1913), No. 4, pp. 247-438).—The climatic conditions of the tropical portions of Florida and the Gold Coast, Mexico, Central America, West Indies, and South America are described, and the relation of natural vegetation, cultivated plants, domestic animals, and races of men to those climatic conditions are discussed in detail. An extensive bibliography of the subject is given.

Bulletin of the Mount Weather Observatory (*U. S. Dept. Agr., Bul. Mount Weather Observ.*, 6 (1913), pt. 2, pp. 35-60, figs. 14).—This number contains the following articles: Vertical Temperature Gradients Between Mount Weather, Va., and Valley Stations, by A. J. Henry; A Change in Skylight Polarization, by H. H. Kimball; and Free Air Data at Mount Weather, Va., for January, February, and March, 1913 (illus.), by W. R. Blair.

Meteorological observations at the Massachusetts Agricultural Experiment Station, J. E. OSTRANDER and E. K. DEXTER (*Massachusetts Sta. Met. Buls.* 299, 300, pp. 4 each).—Summaries of observations on pressure, temperature, humidity, precipitation, wind, sunshine, cloudiness, and casual phenomena during November and December, 1913, are presented. The general character of the weather for November is briefly discussed, and the December bulletin gives a summary for the year. The principal data in this summary are as follows:

Pressure, reduced to freezing and sea level (inches).—Maximum, 30.88, March 18; minimum, 28.55, January 3; mean, 30.037. *Air temperature*, in ground shelter (degrees F.).—Maximum, 100, July 1; minimum, -4.5, February 10; mean hourly, 49.3. *Humidity*.—mean dew-point, 40.1; mean relative humidity, 75.7. *Precipitation*.—Total rainfall or melted snow, 39.5 in.; number of days on which 0.01 in. or more rain or melted snow fell, 135; total snowfall, 26.5 in. *Weather*.—Total cloudiness recorded by sun thermometer, 2,031 hours, or 46 per cent; number of clear days, 105. *Bright sunshine*.—Number of hours recorded, 2,423, or 54 per cent. *Wind*.—Prevailing direction, west; total movement, 55,120 miles; maximum daily movement, 642 miles, January 4; minimum daily movement, 9 miles, September 5; maximum pressure per square foot, 27 lbs., July 23, south-southwest. *Dates of frost*.—Last, May 15; first, September 10. *Dates of snow*.—Last, April 9; first, October 31.

Weather report, W. H. DAY (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm.* 38 (1912), pp. 34-40).—Summaries by months of observations during 1912 at Guelph and other places in Ontario on temperature, rainfall, snowfall, wind, and length of season are given.

A provisional statement regarding the total amount of evaporation by months at 23 stations in the United States, 1909-10, F. H. BIGELOW (*U. S. Dept. Agr., Weather Bur. Abstract of Data* 4, pp. 6).—This statement was compiled from observations by the U. S. Weather Bureau, Reclamation Service, and Geological Survey. The observations were made at Salton Sea, Indio, Mecca, Brawley, Lake Tahoe, and Mammoth, Cal.; North Yakima and Lake

Kachess, Wash.; Hermiston and Ady, Oreg.; Granite Reef Dam, Ariz.; California, Ohio; Birmingham, Ala.; Dutch Flats, Nebr.; Minidoka Dam and Deer Flat, Idaho; Fallon, Nev.; and Elephant Butte, Carlsbad, and Lake Avalon, N. Mex. The observations were made on the ground and at different heights above the ground (2, 10, and 20 ft.).

The annual precipitation of the United States for the years 1872 to 1907, F. H. BIGELOW (*U. S. Dept. Agr., Weather Bur. Abstract of Data 3, pp. 17, figs. 8*).—The annual precipitation at selected stations in seven districts of the United States is shown in tables and charts. The mean annual precipitations as deduced from data are as follows: North Pacific States and northern Rocky Mountain plateau, 23.89 in.; northern Rocky Mountain slope, 19.11 in.; Lake region and central valleys, 35.55 in.; North Atlantic States and New England, 40.61 in.; east Gulf States, 50.04 in.; west Gulf States and southern Rocky Mountain slope, 23.50 in.; and southern Pacific States and southern Rocky Mountain Plateau, 14.55 in.

Precipitation in western Kansas, P. C. DAY (*U. S. Dept. Agr., Weather Bur. Abstract of Data 2, pp. 6, pl. 1*).—Data reported show that "from Lawrence, in the extreme eastern portion, the annual precipitation—36.29 in.—diminishes to 31.43 at Manhattan, to 28.84 at Salina, to 23.48 at Hays, to 20.84 at Gove, and to 16.88 in. at Wallace, in the extreme western part of the State. The total decrease in the annual precipitation from the eastern to the western part of the State is slightly more than 20 in., or about 5 in. for each 100 miles westward. . . .

"Considering the amounts received during the growing season, April to September, inclusive, as compared with the amounts for the same months at Lawrence, the rate of decrease westward is considerably less. Starting with Lawrence, 25.18 in. during the crop-growing season, Manhattan has 23.54 in., or 93 per cent; Salina 21.90, or 87 per cent; Hays 17.89, or 71 per cent; Gove 16.28, or 65 per cent; and Wallace 13.83 in., or 55 per cent of that received at Lawrence.

"The distribution north and south over the State is very nearly uniform, except there appears a slight excess in the norwestern part of the State."

Precipitation in the Panhandle region of Texas, F. H. BIGELOW (*U. S. Dept. Agr., Weather Bur. Abstract of Data 1, pp. 2*).—The average annual rainfall for 28½ years (1880–1908) at Amarillo and Fort Elliott is shown to be 22.39 in.

[Rainfall and flow of streams in Massachusetts in 1912] (*Ann. Rpt. Bd. Health Mass., 44 (1912), pp. 255–271, figs. 7*).—The average rainfall for the year was 39.48 in., as compared with a normal of 44.78 in. There was an excess of rainfall during March, April, May, and December and a deficiency during the rest of the year. The monthly flow during 1912, as compared with previous years and with normal, is reported for the Sudbury, Nashua, and Merrimack rivers. A summary table also shows the weekly fluctuations in flow of these rivers.

The effects of ice on stream flow, W. G. HOYT (*U. S. Geol. Survey, Water-Supply Paper 337, 1913, pp. 77, pls. 7, figs. 18*).—This paper presents the available information on the subject of winter flow, discussing the factors that influence the run-off during the periods of low temperature, the varieties of ice and their effect on the applicability of the laws of open-channel flow, and the collection and interpretation of necessary data.

Report of committee on water supplies (*Amer. Jour. Pub. Health, 3 (1913), No. 12, pp. 1326–1337*).—This report discusses six features of water supply development as follows: Hygienic aspects, rate of installation of filters, sterilization, decolorization with an overdose of coagulant, decolorization as an adjunct of softening, and corrosion of metals.

The hypochlorite treatment is considered principally applicable "for emergency use or as a finishing process after filtration," but "must not be considered as a substitute for other established means of water purification."

Ozone treatment is condemned as expensive and difficult to apply thoroughly. "Somewhat the same remarks may be made about the use of violet rays for the sterilization of water. . . . Its use has been advocated and its success, on a laboratory scale, has been well demonstrated, but its excessive cost, its complicated nature, and the difficulty of making it applicable to the treatment of large volumes of water, together with the other general limitations already referred to, do not at present promise well for its commercial success."

Studies of fish life and water pollution, H. W. CLARK and G. O. ADAMS (*Ann. Rpt. Bd. Health Mass.*, 44 (1912), pp. 336-345).—A report of these studies has been noted from another source (*E. S. R.*, 29, p. 315).

Relation of purity of water supply to typhoid fever, J. W. ELLMS (*Amer. Jour. Pub. Health*, 3 (1913), No. 12, pp. 1290, 1291).—It is stated that in the three years since the introduction of a purified water supply the typhoid death rate of Cincinnati has decreased nearly 80 per cent.

The prevention of typhoid fever in the rural districts of Virginia, A. W. FREEMAN (*Amer. Jour. Pub. Health*, 3 (1913), No. 12, pp. 1322-1325).—The campaign of education of the state health department, emphasizing especially the importance of sanitary privies, suppression of flies, and bedside prophylaxis, is described.

In this campaign special emphasis is not laid upon the water supply because "typhoid fever of the rural districts of Virginia is largely a matter of the summer months," and in these "months the influence of water in the transmission of the disease is not apparently of great importance. . . . The recognition of human filth as the source of the infection, and the avoidance of all fecal contamination, whether by flies, food, clothing, hands, water, or any other means whatever, constitutes the one and only precaution necessary for the absolute prevention of the disease."

The results of the state campaign have been evident. "The interest of the people at large in the prevention of typhoid has been greatly increased and their knowledge of the means necessary to this end enlarged. Bedside prophylaxis has undoubtedly been wonderfully improved. The campaign for the sanitary privy has begun slowly to show results in the building and use of the types recommended by the department. Most important of all, the number of cases, reported and estimated, has shown steady and decisive decline."

SOILS—FERTILIZERS.

A descriptive catalogue of the soils of Virginia so far identified in the soil survey (*U. S. Dept. Agr. Bul.* 46, pp. 21, figs. 7).—The soils of Virginia are classified under 5 soil provinces, which are (1) Piedmont Plateau Province, containing 9,501,600 acres; (2) Appalachian Mountain and Plateau Province, containing 6,420,000 acres; (3) Coastal Plains Province, containing 5,136,000 acres; (4) Limestone Valley and Upland Province, containing 3,081,600 acres; (5) River Flood Plains Province, containing 1,540,800 acres. In province No. 1 the Cecil series ranging in texture from sand to clay is most widely distributed and important, with the Louisa, Chester, and Iredell series, second, third, and fourth, respectively. In province No. 2 the De Kalb series is most widely distributed but has little agricultural value. The Porters series is second in extent and has only average agricultural value, being better adapted to forestry. In province No. 3 the Norfolk series predominates. About 10 per cent of these soils

constitute an important part of the great truck soils of the coast, while the remaining 90 per cent is lying idle or is used for general farming to which they are not adapted. The Portsmouth series in this province is second in extent and if well drained is adapted to truck and garden crops. In province No. 4 the Hagerstown series predominates and is well suited to cultivation. In province No. 5 meadow and swamp soils largely predominate. The cultivated soils are chiefly of the Wickham and Congaree series, both having relatively high agricultural values.

Soil building for South Carolina, W. H. BARTON (*South Carolina Sta. Circ.* 13, pp. 8).—This circular presents by diagram the logical order of practice considered necessary for the enrichment of the soils of the State, briefly indicates some of the results of such practice, outlines methods of procedure, and suggests a plan of cooperation between agricultural and country school education.

The formation of laterite in the soils of southern Italy, L. BERNARDINI and G. MAZZONE (*Staz. Sper. Agr. Ital.*, 46 (1913), No. 2, pp. 146-156; *abs. in Chem. Zentbl.*, 1913, I, No. 18, p. 1624; *Chem. Abs.*, 7 (1913), No. 19, p. 3381).—To determine the extent to which laterite formation had gone on, 5 gm. of the fine soil was first boiled for $\frac{1}{4}$ hour in 80 cc. of hydrochloric acid (specific gravity 1.2). The acid was decanted and the process repeated for $\frac{1}{4}$ hour with fresh acid, then after a second decantation again repeated for $\frac{1}{2}$ hour. The insoluble residue was neutralized, further digested at from 50 to 60° C. for 5 minutes with a solution of sodium hydroxid (specific gravity 1.04), and the silica and alumina determined in the combined acid and alkali extracts. The insoluble residue from this treatment was evaporated to dryness with from 10 to 20 cc. of concentrated sulphuric acid, neutralized with sodium hydroxid, digested for 20 minutes at from 50 to 60° with 80 cc. of sodium hydroxid (specific gravity 1.06) and the silica and alumina determined in the solutions.

If the first treatment (with hydrochloric acid and sodium hydroxid) showed three or more parts of silica to one of alumina this was taken to indicate ordinary clay decomposition. If, however, the ratio was appreciably less than 3:1 and at the same time the ratio obtained by the second treatment (with sulphuric acid and alkali) was over 3:1, laterite formation was indicated.

The results of these tests showed that laterite formations predominated in southern Italy in contrast to the soils of middle Italy.

Report on soil studies in Bessarabia, A. J. NABOKICH (*Internat. Mitt. Bodenk.*, 3 (1913), No. 4, pp. 338-352, pl. 1).—This report describes the geology, climate, and geography of the region in their relations to soil formation and composition.

The geological formations are said to be largely the results of ancient erosions. Chernozem soils rich in carbonates, sodium salts, and gypsum predominate, and some also contain considerable phosphoric acid. As the alkalis are found mainly in the lower strata of these soils, it is concluded that they were formed by the climate of a preceding age.

The main chernozem zone soil is said to contain from 5 to 10 per cent humus, that of the southern border from 3 to 5 per cent, and that of the coast from 2 to 3 per cent.

Podzol soils containing from 2 to 3 per cent humus, extend the length of the Austrian border, while next to them lie alternating strips of degraded and normal chernozem soils. The chernozem soils are in many places covered with sand or sandy soils, especially in the center of the main zone.

Deli soils, J. G. C. VRIENS (*Meded. Deli-Proefstat. Medan*, 7 (1912), No. 6, pp. 297-308).—Tables of chemical, physical, and mechanical analyses of a number of soils are given.

The relation between soil, vegetation, and climate on the islands of East Friesland, F. SCHUCHT (*Internat. Mitt. Bodenk.*, 2 (1912), No. 6, pp. 485-532, pls. 3, figs. 21).—Descriptions are given of the soil, vegetation, and climate of these islands.

The soils are chiefly sand or very sandy clays, very fine grained, with a lime content varying within wide limits. The soil areas are divided into sandy coast plains, sand dunes, and sand marshes. The sandy plain soils contain much lime, chiefly originating from seashells, the newer dunes somewhat less lime, and the old dunes relatively little. Humus is found only in the very old dunes and in the valley dunes and is seldom over one per cent. These soils are very poor in plant food. The sand marshes with a slime covering support a heavy vegetation compared with that of the dunes, and are relatively rich in plant food, especially lime and humus.

The salt content of the ground water and of the soils, which is said to come from sea water, exercises a marked influence on the kind and amount of the vegetation of the islands.

The climate is oceanic, being characterized by a constant temperature, gradual changes from warm to cool and vice versa, high content in the air of moisture, ozone, and salt, uninterrupted air movement, and much sunshine.

Demonstration of the law of minimum, S. GOY (*Mitt. Deut. Landw. Gesell.*, 28 (1913), No. 45, p. 623, fig. 1).—A diagram is given illustrating the law of minimum as applied to growth factors in a soil.

Evaporation of water from soils, C. B. LIPMAN (*Cal. Country Jour.*, 29 (1913), Nos. 35, pp. 1, 14; 37, pp. 1, 2; 39, pp. 1, 2).—This is a popular discussion of evaporation of water from soils in which the work of numerous investigators is briefly reviewed. The effect of soil texture, surface cultivation, and moisture in the air on evaporation from bare soils is pointed out, and means for preventing evaporation are suggested, such as shading, windbreaks, and protective coverings, including straw, manure, and soil or dust mulches. Attention is called especially to the enormous evaporation of water through plant transpiration.

The presence of arsenic as a normal element of soil, G. ZUCCARI (*Gaz. Chim. Ital.*, 43 (1913), II, No. 4, pp. 398-403).—Analyses of 20 soil samples, varying in physical and chemical composition and taken from different depths in different geological formations and at varying elevations, showed an arsenic content varying from 0.187 to 6 parts per 100,000 of soil, being largest in soils containing the most iron compounds, and varying almost directly with the iron content. This is ascribed to the greater tendency of arsenic to combine with iron than with other metals. It is thought that alumina and the carbonates of lime and magnesia may have a minor fixing action on the arsenic. Humus, which was present in abundance in the samples, did not tend to prevent the detection of the arsenic.

Selective adsorption by soils, E. G. PARKER (*Jour. Agr. Research*, 1 (1913), No. 3, pp. 179-188, figs. 2).—Various theoretical considerations bearing on the adsorptive power of soils are discussed, and several series of experiments in which samples of soil were shaken with solutions of potassium chlorid alone and with sodium nitrate, monocalcium phosphate, and other salts and the amount of the adsorbed bases determined by analysis of the resultant solution are reported.

These experiments were based "on the assumption that certain ingredients of the soil adsorb in part the base of a neutral salt in solution and that the free acid resulting from the hydrolysis caused by this adsorption reacts with certain of the soil particles and dissolves an almost equivalent amount of bases of the soil."

Summarizing the results, the author states that "soils not only have the power of adsorbing dissolved salts from solutions, but also of adsorbing one ion at a greater rate than the other, or selectively adsorbing, to a marked extent.

"The presence of bases of the soil (Ca, Mg, etc.) in solution after shaking certain salt solutions with or percolating through a soil is probably not due to a direct chemical reaction of the salt in solution with the silicates of the soil, but to a reaction of free acid, resulting from a selective adsorption of the cation with the mineral components of the soil.

"The rate of adsorption of chlorin ions from solution by soils is much less than of potassium ions. The selective adsorption of potassium from a potassium-chlorid solution by a soil increases in amount with the concentration up to a certain point and then remains practically constant. The percentage of potassium adsorbed from a potassium-chlorid solution increases asymptotically as the concentration of potassium chlorid decreases and at very low concentrations adsorption is practically complete. In general, the smaller the soil particles the greater the selective adsorption of potassium from a potassium-chlorid solution by the soil.

"The presence of sodium nitrate decreases the adsorption of potassium from a solution of potassium chlorid by a soil up to a concentration of about 37.5 gm. of potassium chlorid per liter and then increases it. The presence of monobasic calcium phosphate does not change appreciably the adsorption of potassium from a potassium-chlorid solution by a soil.

"Finally, if a mineral fertilizer be applied to a soil and exposed to the rain and thus dissolved and carried through the soil in solution, these substances will be adsorbed (an entirely physical phenomenon) either as a whole or selectively from the solution by the vast surface of the soil particles and will be held there by this same physical force until the plant or subsequent leaching removes it. The presence of other mineral substances added to the soil may or may not increase or decrease the rate at which this adsorptive phenomenon takes place."

The inactivity of the soil protozoa, R. GREIG-SMITH (*Proc. Linn. Soc. N. S. Wales*, 37 (1912), pt. 4, pp. 655-672, figs. 7; *abs. in Centbl. Bakt. [etc.]*, 2. Abt., 39 (1913), No. 4-7, p. 152).—In these investigations, continuing previous work (E. S. R., 28, p. 623), the author endeavored to test the action of the soil phagocytes (1) by adding them purposely to soil, and (2) by using the extracts of raw soil, as was done by Russell and Hutchinson, taking care to use soil that had not been overheated and to have controls of unfiltered soil extracts to compare with the filtered, presumably protozoa-free, extracts.

It is concluded from the experiments as a whole "that Russell's contention can not be sustained; the protozoa have little or no action in limiting the number of soil bacteria."

It was found that the larger ciliates, such as *Colpoda cucullus*, were not destroyed when comparatively large amounts of volatile disinfectant were added to the soil. "Upon adding suspensions of protozoa, there was no evidence of any limitation in the numbers of the soil bacteria. Any enhanced effect was due to the addition of the bacteria contained in the suspensions. The filtration of a soil extract had no influence, beyond that of removing some of the bacteria in the suspension. Any phagocytic tendencies that the soil protozoa possess have no influence in limiting the numbers of bacteria in the soil. So far as the growth of bacteria is concerned, the effect of heat is of a different character from that of a volatile disinfectant. Inferentially, the toxins and nutrients of the soil are alone concerned with the changes that occur when soils are heated or treated with volatile disinfectants."

Edaphon, R. H. FRANCÉ (*Das Edaphon. Munich, 1913, pp. 99, figs. 35*).—Edaphon, in contrast to plankton, is here understood to be the plant and animal organisms of the soil. The author deals in some detail with the conditions of soil favorable to the life and activity of these organisms, giving a systematic classification and discussion of 120 different organisms and the results and conclusions of a general ecological investigation of the types.

Light was found to influence more or less the distribution of the organisms near the surface and in the soil depths. The edaphon was found to reach the minimum number and distribution in the winter, due to frosts, and the maximum in the spring and fall. Increasing soil moisture was ordinarily found to increase the number and distribution. In most of middle Europe no difference was observed in the edaphic development of soils under like ecological conditions, but ordinarily the number of organisms varied with increasing elevation according to their kind within well defined limits, and independently of the variations caused by other local conditions. The number and distribution was also found to be closely related to the geology of a locality and to the petrographic conditions of the substrata. The edaphon in humus-poor soils showed silica-loving characteristics and many of the organisms were found to exist in entirely humus-free soils. On the other hand, the presence of considerable humus was extremely favorable to their growth. It is concluded that the edaphic organisms are active in the formation of humus, in the development of organic matter in new soils, and also in the weathering of rocks.

In examinations of neutral and acid forest soils many more edaphic organisms were found in the former than in the latter, the most of which were *Difluggia* and relatively large forms. Further investigations led to the conclusion that the *Cladosporium* which were present in large numbers have no fixed influence on the number and distribution of the remaining edaphic organisms.

The siliceous algae were found to predominate the year round in cultivated soil and the rhizopods, nematodes, and *Cladosporium* in the forest soils. The large numbers of rhizopods in forest soils are concluded to be due not only to the greater water content but also to the greater humus content and to the chemical influence of amphibious vegetation. Amphibious vegetation influenced the numbers of soil organisms through its influence on humus, but the edaphic development of the soil was found to increase with the factors which make the soil hygrophytic. Fertilization was most favorable to the growth and increase of the edaphon. A discussion of symbiotic relations leads to the conclusion that the edaphon have symbiotic relations similar to those of plankton. In general it is concluded that the edaphic organisms are indispensable as decomposers of organic matter and as soil ventilators for the metabolism of productive soils, and that their method of multiplying is such as to aid the soil ferments and increase its productiveness.

Studies on nitrogen assimilation by free living organisms, H. B. HUTCHINSON (*Rpt. Brit. Assoc. Adv. Sci., 1912, pp. 740, 741*).—Spring applications of carbohydrates to field soil were followed by decreased crop yields, while autumn applications resulted in a decided increase of yield, due, it is thought, to stimulation of nitrogen assimilation by such organisms as *Azotobacter chroococcum*.

"Pot and laboratory experiments show that when plant residues are added to soil or sand a vigorous decomposition of the cellulose by aerobic organisms ensues, and appreciable quantities of nitrogen are assimilated from the atmosphere."

Some effects of humates on plant growth, W. B. BOTTOMLEY (*Rpt. Brit. Assoc. Adv. Sci., 1912, p. 680*).—The author found that peat moss litter is

entirely unsuited for the growth of plants because of its acid reaction and lack of soluble humates. When the peat was subjected to the action of certain micro-organisms a large quantity of soluble humates was formed and the peat was rendered alkaline. A water extract of peat thus treated was found to be capable of supplying all the necessary plant food for successful water culture experiments. Tomato seedlings failed to grow in raw peat extract, but grew well, flowered, and produced fruit in extract from the treated peat. Similar results were obtained with buckwheat, radishes, and barley.

As no trace of nitrate was found in the peat extract the author concludes that the plants draw their supply of nitrogen from the organic forms of nitrogen in the solution.

Forms of nitrogen compounds in the soil which are direct sources of nitrogen for the higher plants, G. A. RITTER (*Internat. Mitt. Bodenkn.*, 2 (1912), No. 6, pp. 533-540).—From a review of various investigations it is concluded that where, as in the case of moor soils, there is little or no nitrate formation, ammonia compounds and other soluble nitrogenous substances in the soil supply the demands of the higher plants for nitrogen.

Conditions affecting the availability of nitrogen compounds in vegetation experiments, II, J. G. LIPMAN, A. W. BLAIR, I. L. OWEN, and H. C. McLEAN (*New Jersey Stas. Bul.* 257, pp. 3-45, pls. 6, figs. 7; *Rpt.* 1912, pp. 205-248, pls. 6, figs. 7).—This is an account of a continuation of experiments begun in 1911 (*E. S. R.*, 28, pp. 724, 725).

"All of the experiments were carried out in glazed earthenware pots, holding 20 lbs. of pure quartz sand. To this sand there was added for each pot 4 gm. acid phosphate, 2 gm. potassium sulphate, 5 gm. calcium carbonate, 0.5 gm. magnesium sulphate, and 0.25 gm. ferric sulphate. The pots were kept in the open with a provision for covering with canvas at night and during rainy weather. The moisture was kept at 9 to 10 per cent by weighing the pots from time to time, and replacing the loss thus indicated. Barley was planted in all the pots and was allowed to grow to maturity, or as nearly so as was practical, and was then harvested, dried, and the total dry weight recorded. The sample thus prepared was ground and nitrogen determinations made [to give] the total nitrogen in the crop. The pots were run in duplicate, and all nitrogen determinations were also made in duplicate. . . . One set of pots was always run without the special treatment, as a check."

Summarizing the results it is stated that "when sand is mixed in varying proportions with shale soil, the yield of dry matter and the percentage of nitrogen recovered from barley, when nitrate of soda is used, are greater with from 10 to 70 per cent of sand than they are with either the pure soil or with higher percentages of sand. The highest point for yield of dry matter and percentage of nitrogen recovered is reached with 40 per cent of sand.

"The yield of dry matter and the percentage of nitrogen recovered from barley, when dried blood was used, are lower with 40 per cent of sand than with shale soil or with lower percentages of sand. With 50 per cent of sand the yield of dry matter and nitrogen recovered are higher than with 40 per cent. With higher percentages of sand there is a decline in dry matter and percentage of nitrogen recovered, but this decline is much more gradual than it is when nitrate of soda is used.

"The yield of dry matter in the barley on the check cylinders is not, with any of the dilutions, as great as the yield with nitrate of soda or dried blood.

"With a residual crop of buckwheat none of the nitrogen of the nitrate of soda was recovered from any of the cylinders having sand mixed with the soil. A small amount was recovered from the shale soil.

"With the residual crop some nitrogen was recovered where blood was used in each of the ten series. The decline in the recovery with increased quantities of sand was very gradual.

"In the residual crop the yield of dry matter was lowest with nitrate of soda, and highest with blood. The yield from the check cylinders would approximate an average of the other two.

"From this work it seems safe to conclude that it is needless to expect any residual effects from moderate applications of nitrate of soda on open sandy soils. Some residual effects may be expected on such soils from dried blood or other organic fertilizers of a similar character.

"The actual net recovery of nitrogen from the humus of the shale soil, which contained varying proportions of sand, is greater in nearly every case than the theoretical amount as calculated from the recovery from pure shale soil. Mixing sand with heavy shale soil permits better aeration and drainage, and results in a more complete utilization of the nitrogen that is present."

Experiments on the accumulation and utilization of atmospheric nitrogen in field soils, J. G. LIPMAN, A. W. BLAIR, I. L. OWEN, and H. C. McLEAN (*New Jersey Stas. Bul.* 258, pp. 3-24; *Rpt.* 1912, pp. 248-269).—One series of experiments reported in this bulletin was conducted on twentieth-acre plats of gravelly clay loam deficient in nitrogen, the object being "to study the influence of small quantities of cow manure and of the bacteria in it on the decomposition of green manures." Corn was followed by crimson clover and rye as green manures to which were added in different series 50, 100, and 200 lbs. of well-rotted manure broadcast over the green manure before plowing under. Wheat was then seeded.

There was no appreciable improvement of the first crop (corn) in 1908 on manured plats. "In the crops for 1909, 1910, 1911, and 1912 there was with only slight exception a better yield of both dry matter and nitrogen on the plats that received manure than on the check plats. However, the plats that received the most manure did not, in many instances, give the largest yield. On the contrary, the plats that received the smallest application of manure did, in a number of instances, give the largest yields. It therefore appears that the beneficial effects of the manure were physical and biological rather than chemical."

As a rule the plats green-manured with a legume gave a larger yield and crops richer in nitrogen than those green-manured with rye.

In a second series of experiments wheat and rye were grown continuously with and without legumes.

Comparing the 1909 yield of grain, total dry matter, and total nitrogen from the nonlegume plats, both wheat and rye, with those for the 1910, 1911, and 1912 crops there is shown a falling off in yield. On the legume plats there was practically no loss in any case and substantial gains in some instances. "This clearly indicates an improved condition of the soil and shows that it is not only not losing in fertility, but that it is slowly gaining. That is, the nitrogen supply is being kept up by the legume crop, while the land is being continually cropped to rye and wheat. The nonlegume plats are gradually becoming poorer in nitrogen. Without the application of stable manure or commercial nitrogenous materials, the legume plats are producing at the rate of 22 to 30 bu. of grain per acre, are apparently gaining in nitrogen and therefore in humus, and are each year assuming a better mechanical condition, with an extra cost over the nonlegume plats of only about \$4.50 per acre."

Peculiarities regarding the nitrate formation and the nitrate content in moor soil, G. A. RITTER (*Internat. Mitt. Bodenk.*, 2 (1912), No. 5, pp. 411-428).—An investigation of the relations between nitrate formation and nitrate content in moor soils is reported.

In the majority of the samples tested there was found little tendency toward nitrate formation, and in most cases there appeared a reducing tendency instead. Also, few of the moor soils showed the presence of nitrates. It is stated as causes for this that moor soil does not afford a suitable medium for the existence and activity of nitrifying organisms, and that the chemical composition is such as rapidly to reduce nitrates and ammonia rather than to oxidize them. Denitrifying organisms are not thought to play an important part in the reduction of the nitrates in these soils since a steady reduction of nitrates was found in a sterilized humus. From the difficulty experienced in detecting nitrifying organisms under the conditions encountered in the moor soils, and from the fact that nitrates were found in some cases, it is thought that these nitrates may have originated from the action of hitherto unknown nitrifying organisms, but that the conditions encountered in general indicate that the presence and formation of nitrates in these cases is due to a purely chemical oxidation of organic matter.

New nitrogenous fertilizers, A. STUTZER (*Illus. Landw. Ztg.*, 33 (1913), No. 93, p. 839, fig. 1).—Brief reference is made to the possible use as fertilizer of guanidin and urea and nitrates of these compounds derived from calcium cyanamid.

Tests of the agricultural value of Burkheiser salt, M. DE MOLINARI and O. LIGOT (*Ann. Gembloux*, 23 (1913), No. 12, pp. 619–625, figs. 2).—This material, which is a crude ammonium sulphate, obtained by a special process as a by-product of gas making, was tested in pot experiments on soil and sand with oats, the general conclusion being that the fertilizing value of the salt was practically the same as that of ammonium sulphate.

The influence of ferrous sulphate and gypsum on crop yield and nitrogen recovery, J. G. LIPMAN, A. W. BLAIR, I. L. OWEN, and H. C. McLEAN (*New Jersey Stas. Rpt.* 1912, pp. 270–277).—The results of four years' plat experiments with corn, oats, wheat, and timothy, using ferrous sulphate at rates of 50, 100, and 200 lbs. per acre and gypsum at rates of 200, 500, and 1,000 lbs. per acre in connection with other necessary fertilizing materials, are reported.

The results show that there was an increase in dry matter and total nitrogen in every case where iron sulphate was used. The plat receiving iron sulphate at the rate of 100 lbs. per acre made the greatest gains in total nitrogen in every case and the greatest gains in crop and total dry matter in nearly every instance. As a rule, the plat receiving iron sulphate at the rate of 200 lbs. per acre made the least gain.

The corn crop on the plat receiving gypsum at the rate of 1,000 lbs. per acre made gains in grain, dry matter, and nitrogen comparable with those made on the plat receiving 100 lbs. of iron sulphate. The other gypsum plats either made only slight gains or yielded less than the check plat.

Magnesia in agriculture, A. HUTIN (*Bul. Assoc. Chim. Sucr. et Distill.*, 31 (1913), No. 5, pp. 347–351).—This article discusses briefly the relation of magnesia to nitrification in soils and the growth of plants. A number of determinations showing the relation of total and soluble magnesia and the lime-magnesia ratio of a coastal plain sugar-cane soil in Peru are reported, and comparing these data with the growth of cane the author reaches the general conclusion that cane is able to accommodate itself to soils which contain from 1.5 to 4 times as much lime as magnesia.

The fish-scrap fertilizer industry of the Atlantic coast, J. W. TURRENTINE (*U. S. Dept. Agr. Bul.* 2, pp. 50, pls. 6).—This bulletin presents a summary of information regarding the history and present status of the fish-scrap fertilizer industry in terms of equipment and output and its proposed and possible development, including a discussion of the particulars in which the processes now

in vogue could be improved and the means whereby the industry could be put on a more secure economic basis.

It is stated that there are at present over 40 factories on the Atlantic seaboard which manufacture fish scrap, including only those whose main output is fish scrap and fish oil. These are distributed as follows: Maine and Florida, 1 each; Connecticut and Delaware, 2 each; New York, 3; New Jersey, 5; North Carolina, 11; and Virginia, 21. The output of these factories in 1912 is stated to have been: Maine, 100 tons acid and 250 tons dry scrap; Connecticut, 1,500 tons acid and 6,500 tons dry; New York, 19,800 tons acid; New Jersey, 530 tons acid and 1,500 tons dry; Delaware, 6,312 tons acid and 500 tons dry; Virginia, 34,000 tons dry; North Carolina, 7,250 tons dry; and Florida, 160 tons dry.

The character, habits, and economic value of the menhaden and other fish used in the industry are discussed and the methods of catching the fish and working them up into scrap and oil are described. Data are also given regarding the composition and uses of the products, including that of using the scrap as a cattle feed.

Inspection of commercial fertilizers, H. D. HASKINS, L. S. WALKER, C. P. JONES, and W. S. FROST (*Massachusetts Sta. Bul.* 147, pp. 96).—This bulletin gives a detailed report on fertilizer inspection in Massachusetts in 1913, including analyses and valuations of 541 samples of mixed fertilizers, fertilizing materials, and lime products. It discusses valuations, cost and quality of fertilizers sold in the State, commercial shortages in both unmixed fertilizing materials and mixed goods, and the economy of purchasing only high-grade fertilizers.

A brief account is also given of comparative tests of various stone meal fertilizers. These experiments were made with corn, oats, and potatoes. There was apparently some slight benefit from the use of the ground rock fertilizers, but not such as to justify the extravagant claims made by the manufacturers of these products.

Average composition of commercial fertilizers from 1880 to 1912, C. S. CATHCART (*New Jersey Sta. Rpt.* 1912, pp. 36-38).—The average composition of each year's output of mixed fertilizers as inspected by the station from 1880 to 1912 is shown in a table. The number of samples upon which the averages are based increased from 93 in 1880 to 847 in 1912. The only marked change in composition was the increase of potash from 2.71 per cent in 1880 to 6.71 per cent in 1912.

Analyses and valuations of commercial fertilizers, fertilizer supplies, and home mixtures, C. S. CATHCART ET AL. (*New Jersey Sta. Bul.* 259, pp. 3-41).—This bulletin reports analyses and valuations of 539 samples of fertilizing materials representing a part of the samples of such materials collected during the season of 1913.

Report on commercial fertilizers, 1913, E. H. JENKINS and J. P. STREET (*Connecticut State Sta. Rpt.* 1913, pt. 2, pp. 97-180).—Analyses and valuations of 894 samples of fertilizers collected and examined during the 1913 inspection are reported and the character of the raw materials of fertilizers examined is discussed.

Analyses of commercial fertilizers, B. L. HARTWELL ET AL. (*Rhode Island Sta. Insp. Bul.*, 1913, Oct., pp. 3-12).—This is the third and last report on analyses and valuations of fertilizers collected during 1913.

AGRICULTURAL BOTANY.

Heredity of quantitative characters, A. B. BRUCE (*IV. Conf. Internat. Génétique Paris, Compt. Rend. et Raps.*, 1911, pp. 96-98).—The author states that it can not be affirmed with certainty that Mendelian laws apply to quantitative

characters. It is suggested that possibly increase of vigor in hybrids will be found dependent on an aggregate of dominant characters.

An examination of the theory of factors by the methodical recrossing of hybrids, E. VON TSCHERMAK (*IV. Conf. Internat. Génétique Paris, Compt. Rend. et Raps., 1911, pp. 91-95, pls. 10*).—A test was made of the theory of factors, according to which certain units, acting either independently or in cooperation, give rise to the visible characters of species and races. This theory is held to give a satisfactory explanation both of the production of new forms resulting from hybridization and also of complicated cases of Mendelian inheritance.

Reduplication of terms in series of gametes, W. BATESON and R. C. PUNNETT (*IV. Conf. Internat. Génétique Paris, Compt. Rend. et Raps., 1911, pp. 99, 100*).—The authors present a new explanation of the phenomena of coupling and repulsion and state that evidence has been found which proves that these are influences of the same phenomenon and that in each the effects are produced by reduplication of those gametes which represent the parental characters.

Concerning geographical races with fixed and variable characters, J. V. VIVIAND-MOREL (*IV. Conf. Internat. Génétique Paris, Compt. Rend. et Raps., 1911, pp. 266-274*).—A review is given of a study of a large number of Linnæan types of plants indigenous to France and other parts of southern Europe and northern Africa, from which the author concludes that the races which compose the original types do not in all cases possess fixed characters. In the case of perennial and shrubby plants they seldom breed true, although in annual species the great majority of such forms reproduce themselves by seed.

Mendelism and acclimatization, H. NILSSON-EHLE (*IV. Conf. Internat. Génétique Paris, Compt. Rend. et Raps., 1911, pp. 136-157*).—The author claims that his experiments with cereals indicate that there is a certain relation between the adaptive changes of plants called hereditary acclimatization and the regrouping of Mendelian factors. Acclimatization is believed to be due to a regrouping of the components or Mendelian factors already existing, resulting in more advantageous combinations.

Variation in first generation hybrids: Its possible explanation through zygotaxis, W. T. SWINGLE (*IV. Conf. Internat. Génétique Paris, Compt. Rend. et Raps., 1911 pp. 381-394, figs. 10*).—The author describes experiments conducted under the auspices of this Department in crossing various Citrus species, and accounts for the variation by the positional relation of the chromosomes. He suggests for this supposed positional influence the name zygotaxis, and by this he means the arrangement in the syngamete or zygote of the chromatin and other hereditary substances derived from the parental gametes and the persistence of this arrangement in the cells produced by the subdivision of the syngamete.

Mosaic heredity, L. BLARINGHEM (*IV. Conf. Internat. Génétique Paris, Compt. Rend. et Raps., 1911, pp. 101-131, figs. 19; abs. in Bul. Soc. Bot. France, 60 (1913), No. 4, pp. 282, 283*).—The author designates as mosaic heredity that method of special transmission by which is manifest in the descendants the corresponding characters of the parents. Attention was first called to this method by Naudin in 1859, and it is said that it offers analogies to alternate and Mendelian heredity. The author describes a number of examples of this form of heredity and discusses their common characters and means for distinguishing them from the so-called graft hybrids.

A bibliography is appended.

Is the law of uniformity of hybrids of the first generation absolute? M. R. GARD (*IV. Conf. Internat. Génétique Paris, Compt. Rend. et Raps., 1911, pp. 197-200*).—The author states that although Naudin concluded from his experiments that all hybrids derived from a cross resemble each other in the first gen-

eration, as a result of his own experiments in hybridizing a number of species of *Cistus* he considers that these conclusions are not confirmed.

Two species derived from a hybrid when crossed with each other do not obey the Mendelian law of dominance, G. BELLAIR (*IV. Conf. Internat. Génétique Paris, Compt. Rend. et Raps., 1911, pp. 201-203*).—Experiments with some *Nicotiana* hybrids are reported which indicate that at least in this case two species derived from a hybrid when crossed with each other do not obey the Mendelian law of dominance.

The variability of micro-organisms and the inheritance of acquired characters, B. HEINZE (*IV. Conf. Internat. Génétique Paris, Compt. Rend. et Raps., 1911, pp. 278-289*).—An account is given of variations that have been observed in different bacteria and fungi.

Azotobacter was found subject to morphological change under the influence of external conditions, depending upon the stage of development. If the amount of combined carbon was reduced in the media in which pure *Azotobacter* was cultivated and small quantities of asparagin were given, forms of *A. chroococcum* and of a blue-green alga appeared which seemed very closely related to the colorless forms of *Azotobacter*. This would indicate that *Azotobacter* is not a pure species, but the question is not definitely decided.

Other examples of the influence of the culture media on algae and on *Bacillus prodigiosus* and *B. cyanogenus* are reported.

Mutations in pure lines of beans, W. JOHANNSEN (*IV. Conf. Internat. Génétique Paris, Compt. Rend. et Raps., 1911, pp. 160-163*).—The author reports the occurrence in pure lines of beans of two mutations. The first appeared in 1903 and was immediately constant, while the second appeared in 1907 and was recognized as being in a heterozygous condition. The first was characterized by great size and the relatively narrow shape of the beans, while the second was a broad biotype which could be extracted from the original heterozygote through segregation.

Grafting and asexual hybridization, E. GRIFFON (*IV. Conf. Internat. Génétique Paris, Compt. Rend. et Raps., 1911, pp. 164-196, figs. 24*).—Descriptions are given of a number of forms, designated by the author as hybrids, which have occurred as the result of grafting. These include not only annuals and herbaceous perennials, but a number of woody plants as well.

Notes on parthenogenesis in plants, ROSE H. THOMAS (*IV. Conf. Internat. Génétique Paris, Compt. Rend. et Raps., 1911, p. 209*).—As a result of her experiments the author has proved that parthenogenesis is possible in several species of *Nicotiana* and also in the evening primrose and cucumber. Parthenogenetic seeds from these plants were found to reproduce the parental type and the plants were normal and bore fertile anthers.

Genetic and nongenetic factors in the improvement and breeding of new varieties, A. L. HAGEDOORN (*IV. Conf. Internat. Génétique Paris, Compt. Rend. et Raps., 1911, pp. 132-135*).—Attention is called to the genetic and environmental factors that influence plant breeding, and the author urges that special care be given to all F_1 individuals so that the number of second generation hybrids may be increased as rapidly as possible. He claims that the F_1 generation should be especially protected against frost and drought.

The application of the principles of genetics to some practical problems, C. C. HURST (*IV. Conf. Internat. Génétique Paris, Compt. Rend. et Raps., 1911, pp. 210-221*).—A description is given of the results of hybridizing garden peas, sweet peas, orchids, primulas, snapdragons, barberries, forest trees, fruit trees, cabbage, etc.

A study of abnormal characters in seedlings, with a view to obtaining new varieties, N. STRAMPELLI (*IV. Conf. Internat. Génétique Paris, Compt. Rend. et*

Raps., 1911, pp. 237-246, figs. 11).—The author gives an account of experiments with wheat and various species of Leguminosæ, the object being to test the value of selecting those seedlings representing abnormalities as a possible means of developing new varieties.

In the case of wheat, precocity of development was found to be an inherited character, and two forms were obtained which were characterized by marked precocity, short stalk, and stiffness of straw. With alfalfa, clover, and sainfoin, only a small proportion of the descendants possessed the abnormal type.

The breeding of double flowers, EDITH R. SAUNDERS (*IV. Conf. Internat. Génétique Paris, Compt. Rend. et Raps.*, 1911, pp. 397-405).—In this paper the author deals with a number of practical questions relating to the breeding of double-flowered plants. She distinguishes three types or grades of doubling. In the first the flower becomes so double that neither pollen nor ovules are produced. In the second the organs of only one sex are aborted, while those of the other remain functional. In the third, which is by far the largest class, doubling occurs without loss of function in the reproductive organs of either sex.

Considering the question of singleness or doubleness, it is stated that singleness is due to the presence of two factors while doubleness is due to the absence of either or both of them. In the nondoubling single type these factors are linked together, while in the eversporting single type the factors are not linked. All four combinations of the allelomorphs occur among the ovules in an ever-sporting single, but the pollen appears unable to carry the two factors, either alone or together. This is said to be a case of what has been termed partial coupling combined with a sex limited distribution of the factors.

A popular account of this investigation has been noted elsewhere (*E. S. R.*, 29, p. 341).

Hybrids between species of *Antirrhinum*, J. P. LOTSÝ (*IV. Conf. Internat. Génétique Paris, Compt. Rend. et Raps.*, 1911, pp. 416-428, figs. 9).—A description is given of hybrids grown by the author from seeds produced by E. Baur and crossed on a number of species of *Antirrhinum*. He concludes from his experiments that segregation and the recombination of factors are not limited to hybrids between varieties, but may also occur in hybrids between certain species.

Nicotiana crosses, ROSE H. THOMAS (*IV. Conf. Internat. Génétique Paris, Compt. Rend. et Raps.*, 1911, pp. 450-461, figs. 6).—Descriptions are given of a number of *Nicotiana* hybrids and a detailed account is presented of the differences observed in the pollen grains.

In most species of *Nicotiana* the pollen grains are oval and either large or small. In *N. tabacum* and its allies they are square or approaching that shape, while in *N. sylvestris* they are round. The segregation of pollen was observed in all the different crosses.

Experiments in crossing a wild pea from Palestine with commercial peas with the object of tracing any specific identity between this wild pea and peas of commerce, A. W. SUTTON (*IV. Conf. Internat. Génétique Paris, Compt. Rend. et Raps.*, 1911, pp. 358-367, figs. 4).—An account is given of experiments in crossing a species of peas obtained in Palestine in 1904 with some cultivated varieties of *Pisum sativum* to determine if possible whether the first species could be considered the ancestor of some of the cultivated forms. About 40 crosses were made between this species and *P. sativum* and *P. arvense*, but in only 4 cases were the hybrids carried to the F_3 generation, the others being sterile.

The results obtained can not be considered as demonstrating that the Palestine pea was the forerunner of the present garden peas. While some of the hybrids were fertile, yet the character of the flowers, leaflets, and pods, the

type of seed, and the sterility of most of the hybrids would probably indicate that it is not to be so considered.

The production of varieties of wheat possessing a high degree of baking strength, C. E. SAUNDERS (*IV. Conf. Internat. Génétique Paris, Compt. Rend. et Raps., 1911, pp. 290-300*).—A description is given of work that has been carried on at the Canada Experimental Farms in an attempt to produce early wheats of a greater degree of strength than those commonly planted.

It was found that strength can not be considered a simple Mendelian character. It depends on numerous factors and is extremely complex, and its inheritance is said to be still far from being understood.

A biometrical study of the seeds of the genus *Brassica*, P. MONNET (*IV. Conf. Internat. Génétique Paris, Compt. Rend. et Raps., 1911, pp. 406-415*).—The author gives the results of an attempt at a biometrical classification of 8 species and varieties of *Brassica*, preliminary to a study of variability and heredity in these plants.

The development of disease-resistant varieties of plants, W. A. ORTON (*IV. Conf. Internat. Génétique Paris, Compt. Rend. et Raps., 1911, pp. 247-265, figs. 9*).—A description is given of some of the work of this Department in the breeding of cotton, cowpeas, and melons for disease resistance.

Experiments with peas in one variety of which the seeds adhere to each other, P. DE VILMORIN (*IV. Conf. Internat. Génétique Paris, Compt. Rend. et Raps., 1911, pp. 368-372, figs. 2*).—The author crossed a variety of peas characterized by the adherence of the peas in the pod with other varieties to determine whether this character of adhesion would be inherited. A study of the third generation shows that there is apparently some connection between the factors for type of foliage, pigment, and the adhering character.

Variability in seeds, B. D. HALSTED ET AL. (*New Jersey Stas. Rpt. 1912, pp. 386-395, pls. 3*).—A study was made of soy beans, pea beans, cowpeas, and Lima beans to determine the relation of location in the pod to the size of the seed. In the soy beans it was found that the tip seeds in the three-seeded pods were the heaviest and the middle seeds next. In the pea beans the seeds nearest the middle of the pod were the heaviest and those at the end the lightest, the basal ones being the lightest of all. In the cowpeas the middle seeds were the largest and those at the tip the lightest. In the Lima beans all the basal seeds were the lightest in their respective sets, the tip seeds being the heaviest in the two-seeded and lightest in the four-seeded pods.

A study was also made of position and desirability of seeds, these being grouped according to seeds of average size, exhibiting plumpness and maturity, these being taken as the standard, and those below the average, which were considered imperfect. In the soy beans and in the Lima beans with a single exception the largest percentage of standard seed was from the tip portion of the pod and in the cowpeas from the middle position of the pod.

Additional notes are given on the position, attachment, and development of the seed in the pods of a number of leguminous plants.

Study of the hypocotyl in the field, B. D. HALSTED ET AL. (*New Jersey Stas. Rpt. 1912, pp. 395-397, pl. 1*).—A note is given on investigations begun to determine the inheritance of length of hypocotyl in field grown plants. This work has been taken up with soy beans, pea beans, and sunflowers, and the material collected for further study.

The study of the hypocotyls of some root crops, B. D. HALSTED ET AL. (*New Jersey Stas. Rpt. 1912, pp. 397, 398, pl. 1*).—A brief report is given of a study of the hypocotyl of radish plants, in which the development of the hypocotyl is traced from the seedling stage to the mature root.

The failure of plants grown in window boxes to develop fleshy roots is attributed to the abnormal elongation of the hypocotyl, and it was found that when the hypocotyl elongates to twice or more its normal length all power of transforming into a thickened root is lost.

Observations made on a number of other root crops show that the same phenomenon is possessed by them as the radish.

Tuber formation by potato, G. BAUER (*Natur*, 17 (1912), p. 363, fig. 1; *abs. in Bot. Centbl.*, 123 (1913), No. 9, pp. 218, 219).—A potato plant grown in good soil in a flower pot and covered with a dark pasteboard cylinder during most of the early and all of the latter portion of its growth, was found in September to have well developed tubers and to bear normal leaves on the part grown in exposure to light.

The effects of assimilation in cultivated plants, S. STRAKOSCH (*IV. Conf. Internat. Génétique Paris, Compt. Rend. et Raps.*, 1911, pp. 275-277).—The author has attempted to estimate the value of the materials taken from the soil by various cultivated plants. The estimation of the nutrients consumed by the plant is made from a chemical analysis of the entire plant, and the value of the produce is calculated according to the physiological values of the utilizable substances harvested. Taking the value of the elements absorbed from the soil as 1, the different crops reported ranged from 1.6 to 24.75. Oats are given at 3.25; wheat, 4; barley, 4.5; potato, 5.5; sugar beets, 9.3; alfalfa, 12.75; and sainfoin, 20.75.

Alternations of humidity and dryness as affecting germination of seeds of some weeds, O. MUNERATI and T. V. ZAPPAROLI (*Staz. Sper. Agr. Ital.*, 46 (1913), No. 3, pp. 157-195).—Pursuant to work previously reported (*E. S. R.*, 28, p. 427), the author gives tabular details of studies, on about 30 kinds of seeds, carried out under controlled conditions from the summer or fall of 1910 through May of 1912.

It is stated that among the plants which germinate slowly and partially when kept in a constantly moist medium, but quickly and in high percentages when brought into a humid atmosphere after long dryness, are *Avena fatua*, *Galium aparine*, *Papaver rhæas*, *Plantago lanceolata*, and *Amarantus retroflexus*. Among those which germinate in low percentages in alternating humidity and dryness are *Rapistrum rugosum*, *Myagrum perfoliatum*, *Sinapis arvensis*, *Salvia pratensis*, *Abutilon avicennæ*, *Setaria italica*, and *Oenothera biennis*. Among those which may long retain vitality without germination in a medium alternating between humidity and dryness are *Convolvulus sepium*, *Lappa major*, *Sorghum halepense*, and *Solanum nigrum*. Among those apparently but little affected by variations of humidity are *Vicia segetalis*, *V. cracca*, *V. hirta*, *Lathyrus aphaca*, *Cirsium arvense*, *Eruca sativa*, *Daucus carota*, and *Cuscuta epithymum*. *Panicum crus-galli* and *Rumex crispus* are among those which, while germinating more or less in any sort of alternations of humidity and dryness, do not germinate in continuous humidity but are able to retain long their vitality.

Influence of manganese sulphate on germination, J. CROCHETELLE (*Jour. Agr. Prat.*, n. ser., 26 (1913), No. 39, pp. 398, 399).—Reporting results of experiments carried out with seeds of several common plants subjected to the action of manganese sulphate in different strengths, the author states that the species tested behaved very differently at different concentrations. The germination of clover fell off very rapidly at concentrations above 1 per cent, the cereals appearing more indifferent to an increase of concentration. In limy clay soil 2 concentrations favorable to germination were found, one about 0.1 to 0.2 per cent, the other about 0.8 to 1 per cent.

Influence of external conditions on resistance to cold by perennial plants, A. WINKLER (*Jahrb. Wiss. Bot. [Pringsheim]*, 52 (1913), No. 4, pp. 467-506, fig. 1; *abs. in Riv. Patol. Veg.*, 6 (1913), No. 7, p. 221).—Details and tabulated results are given of experiments on many deciduous and evergreen plants, all of which were able to bear a temperature of -20° C. in winter. When gradually approached, a winter temperature of -30° was borne, the younger evergreen foliage proving more resistant than the older. In the growing period newly formed buds and foliage of evergreen withstood -3 to -5° . The resting buds, the older assimilating organs, and the wood of evergreens bear in summer temperatures of -8 to -10° .

Trees accommodate themselves quickly to low temperatures, the wood of evergreens exceeding the mature needles and leaves in this respect, and these in turn greatly exceed young leaves and buds, in case of which accommodation extends readily beyond -5° but not to -15° . Leaves of evergreens and twigs of other trees can endure, from 4 to 6 times, if gradually approached, temperatures below their ordinary death point. Osmotic pressures and turgor are heightened in cold.

A bibliography is appended.

FIELD CROPS.

[Cost of production of different farm crops at the New Jersey Stations] (*New Jersey Stat. Rpt.* 1912, pp. 173-193).—In this report the costs of different crops produced on the college farm, as derived from careful records kept of each field, are given.

The record for timothy hay showed a value per acre of \$67.90, an average cost per acre \$32.69, and an average cost per ton \$9.78. The record for alfalfa showed a value per acre of \$49.68, a cost per acre of \$5.21, and an average yield per acre of 2.72 tons. For another field the value per acre was \$40.73, the cost per acre \$8.29, and the yield 2.4 tons. Another field of 9 acres showed an average total cost per acre of \$25.76 in seeding it to alfalfa. The record of a crop of oats and peas for forage showed a value per acre of \$38.33, a cost per acre of \$29.79, and a yield of 2.4 tons. The cost of sowing a cover crop of rye and vetch was \$14.54 per acre. Another field of oats and peas showed a value per acre of \$26.94, and a cost per acre of \$20.70.

The record of a corn silage crop showed a value per acre of \$28.90, a cost per acre of \$19.09, and a yield per acre of 6.2 tons. Records of another field showed a crop value of \$34.69 per acre, a cost of \$19.47 per acre, and a yield of 6.4 tons per acre. The cost of seeding a cover crop of wheat and vetch was given as \$3.22 per acre.

Similar data are also given for other crops, and copy of the record time sheet is presented.

Twenty-third report of cooperative field experiments, 1911-12, B. R. LARSEN ET AL. (*Aarsber. Norges Landbr. Høiskoles Akervekstforsök*, 23 (1911-12), pp. 123+15).—This report gives the usual accounts of an aggregate of 280 variety tests and fertilizer trials conducted during the year at farms in different parts of Norway under the direction of the Aas Agricultural College (E. S. R., 23, p. 432). The results of the following series of trials are discussed in detail: Twelve years' comparative variety tests of spring grains under different conditions of growth; trials with 3 different amounts of seeds of oats and barley, 1899-1911; 8 years' comparisons of sprouted and unsprouted seed potatoes; and 9 years' comparisons of potato varieties grown on 84 trial farms in different parts of Norway, 1904-1912.

The removal of mineral matter from unfertilized soil by different varieties of plants, I, A. STRIGEL (*Landw. Jahrb.*, 43 (1912), No. 3, pp. 349-366).—This paper reports the results of determinations of the ash and nitrogen content of 4 legumes and 5 grass varieties grown for this purpose in 1906 and 1907 (see below), and also those of 12 native plants mostly classed as weeds. The figures are presented in numerous tables of comparisons in various relations, and the results are discussed. Analyses of samples of the surface and subsoil taken each year from the plats are shown.

Percentage of ash constituents in the dry matter of legumes and grasses.

Kind of plants.	CaO.	MgO.	K ₂ O.	Na ₂ O.	P ₂ O ₅ .	SO ₃ .	Cl.	SiO ₂ .
	<i>Per ct.</i>	<i>Per ct.</i>	<i>Per ct.</i>	<i>Per ct.</i>	<i>Per ct.</i>	<i>Per ct.</i>	<i>Per ct.</i>	<i>Per ct.</i>
Trifolium.....	2.233	0.657	2.292	0.076	0.576	0.271	0.650	0.410
Medicago.....	2.681	.418	2.789	.204	.849	.783	1.304	.538
Ornithopus.....	1.900	.338	2.591	.091	.650	.237	.320	.559
Vicia.....	2.828	.661	2.776	.131	.792	.455	.948	1.512
Phleum.....	.874	.218	2.619	.053	.607	.179	1.092	3.054
Festuca.....	.508	.209	1.830	.049	.463	.230	.618	1.646
Agrostis.....	.392	.189	1.643	.075	.451	.193	.539	1.632
Poa.....	.422	.146	1.624	.068	.431	.138	.445	2.000
Aira.....	.520	.202	2.041	.054	.587	.162	.509	1.901

The influence of botanical composition, of origin, and of harvest time on the chemical composition of hay, II, A. STRIGEL (*Landw. Jahrb.*, 43 (1912), No. 3, pp. 366-371).—Analyses of hay samples from East Prussia averaged richer in protein and fat and poorer in crude fiber than those from the experiment field in Berlin. Hay samples from Oberlausitz ranked between the legumes and grasses of the Berlin field in nitrogen, crude fiber, and carbohydrates, but were richer than either in fat and ash. The calcium and magnesium in the dry matter was about midway between that in the legumes and grasses. The content of potash, sodium, phosphoric acid, chlorin, and especially silica, was higher than in either of the Berlin crops. It is noted that in general the predominance of one plant species or another would change the composition of the dry matter or of the ash, but that this difference is not so marked as the difference between the Papilionaceæ and Gramineæ.

The percentage of organic substances in the dry matter changed with the time of harvest, but not uniformly, while the ash constituents showed greater regularity. As the season progressed the hay showed an increase of calcium and magnesium; at first a reduction then a slight increase in potash; and at first an increase then a reduction in sodium. The percentage of phosphorus in the hay diminished from the early to the normal cutting time. Sulphuric acid, chlorin, and silica showed an increase during the season.

Range improvement by deferred and rotation grazing, A. W. SAMPSON (*U. S. Dept. Agr. Bul.* 34, 1913, pp. 16).—In this bulletin the author discusses the causes of deterioration in ranges, the requirements of plant growth, the maintenance of a maximum forage crop, and the application of a system of deferred grazing to range management. It is claimed that deferring grazing over a portion of the range until the seed has matured, and then grazing it to avoid loss of forage*through nonuse, and to assist reproduction by trampling in the seed restores and maintains the vegetation without the loss of the forage crop in any year, insures the seed being planted, thereby overcoming the chief disadvantage of year-long protection, and does away with the fire danger resulting from the accumulation of inflammable material under year-long protection.

Experimental cultures of pure types of cereals, [with] observations on the stability and variability of their characters, BŒUF (*IV. Conf. Internat.*

Génétique Paris, Compt. Rend. et Raps., 1911, pp. 319-327).—"A pure variety of cereal must be regarded as a natural type which it is impossible to modify by any direct action. The hereditary characters of such a type depend on the ancestry; the variable characters depend on the conditions of life; selection of individuals is without effect. By the selection of large grains an increase in the yield may be obtained under certain conditions and within limits which our experiments have not yet fixed. The only means by which improvements can be effected are by bringing to perfection cultural methods, in the production of new types by hybridization, and in taking advantage of fortuitous variations, of which many owe their origin to natural hybridization."

Right- and left-handedness in cereals, R. H. COMPTON (*IV. Conf. Internat. Génétique Paris, Compt. Rend. et Raps., 1911, pp. 328-331*).—The author gives the results of observations of not less than 19,165 barley seedlings, 469 oat seedlings, and 6,189 maize seedlings, his conclusions being substantially as previously noted (*E. S. R., 27, p. 236*).

Fertilizing cereals, A. ZARAGÜETA (*Prog. Agr. y Pecuário, 18 (1912), Nos. 788, pp. 547-550; 789, pp. 563-567, figs. 10*).—In fertilizing wheat a yield of 2,120 kg. of grain per hectare (1,887 lbs. per acre) followed an application of 360 kg. superphosphate, 120 kg. ammonium sulphate, 100 kg. nitrate of soda, and 100 kg. potassium chlorid; 1,480 kg. was produced without the potassium chlorid and 1,050 kg. without any fertilizer. The apparent increases in yields by the use of fertilizers ranged from 1,247 to 2,967 kg. per hectare with barley, 730 to 1,720 kg. with oats, and 320 to 1,905 kg. with rye.

On the cultivation and inoculation of legumes, A. EICHINGER (*Pflanzer, 8 (1912), No. 4, pp. 190-219*).—This article discusses the cultivation and usefulness of the following legumes: As green manures, beggar weed (*Desmodium tortuosum*), Jack beans (*Canavallia*), soy beans, cowpeas, red clover, peanuts, velvet beans (*Mucuna utilis*), Japan clover (*Lespedeza striata*), *Medicago arborea*, Mexican clover (*Richardsonia [scabra] glabra*), *Indigofera galeoides*, indigo (*Tephrosia purpurea*), and yellow trefoil (*Medicago lupulina*); alfalfa, beggar weed, red clover, white clover, crimson clover, and cowpeas as forage plants; and soy beans, garden beans, lentils, and Jack beans (*Canavallia ensiformis*) as grain crops.

Experiments in inoculation showed in general a considerable increase by the addition of bacteria, whether by pure cultures, the introduction of tubercles, or otherwise.

Phosphorus for alfalfa fields, J. E. WING (*Breeder's Gaz., 64 (1913), No. 3, p. 89, fig. 1*).—This article relates instances in which annual applications of 400 lbs. of acid phosphate per acre as a top-dressing greatly increased the yields of hay, in some cases approaching 200 per cent. The influence of the phosphorus is ascribed not only to its direct manurial value but also to its favorable influence on bacterial development.

Alfalfa in South Carolina, A. G. SMITH (*South Carolina Sta. Circ. 19, pp. 22, figs. 3*).—The author discusses the following topics with special reference to South Carolina conditions: Who should plant alfalfa; alfalfa versus other hay crops; adaptation of soils; injurious weeds, including crab grass, Bermuda grass, and nut grass; preceding crops; seed and time of seeding; preparation of the land; liming; fertilization before and after planting; inoculation; planting; cutting and curing the hay; pasturing; cultivating; diseases; yields and life of alfalfa; and reseeding an old field.

Mosaic inheritance in the hybrids of barley, L. BLARINGHEM (*Compt. Rend. Acad. Sci. [Paris], 156 (1913), No. 13, pp. 1025-1027*).—The author presents data on the behavior of the transmission of the awn and awnless characters in crossing 5 varieties of barley and their reciprocals, viz, *Hordeum distichum*

nutans × *H. distichum nudum*, *H. distichum erectum* × *H. distichum nudum*, *H. coeleste trifurcatum* × *H. distichum nutans*, *H. coeleste trifurcatum* × *H. zeocriton*, and *H. coeleste trifurcatum* × *H. stuedelii*. It is pointed out that the rules of heredity discovered by Naudin have special application in crossing different species and govern the character of abortiveness in such crosses. See also another article abstracted on page 328 of this issue.

Behavior, under cultural conditions, of species of cacti known as *Opuntia*. D. GRIFFITHS (*U. S. Dept. Agr. Bul. 31, pp. 24, pls. 8, fig. 1*).—This bulletin records observations taken at Brownsville and San Antonio, Tex., and Chico, Cal., on between 600 and 1,500 varieties of prickly pear and cane cacti. Notes and discussions include spine variation, adaptability to conditions, excessive development of spicules, locality variations, effect of housing, longevity, effect of low temperatures, coloration, proliferation of fruit, habits of the plants, and moisture requirements.

It is noted that "all forms thrive best when the moisture supply is low during the dormant season. Wherever tried, some species or form native to the region has proved more productive than introduced forms. . . . Considering the succulence of the plants, their power of recovery from the effect of low temperatures is remarkable. Large limbs which hang limp beside the plants will often regain their normal position upon the advent of growing weather, provided they are not disturbed while the weather is cold. . . . Proliferation of fruit is not necessarily a specific characteristic but may be brought on by extraneous conditions. If this habit could be induced in the economic forms their value for forage would be decidedly increased. In all of the larger species especially, the plants grown from cuttings and those grown from seed present a very different appearance; the latter are treelike and the former are headed on the ground without distinct stems."

The result of selecting fluctuating variations, F. M. SURFACE (*IV. Conf. Internat. Génétique Paris, Compt. Rend. et Raps., 1911, pp. 222-236*).—The author gives the results obtained at the Illinois Experiment Station in the production of high protein, low protein, high oil, and low oil varieties of corn as previously noted (*E. S. R., 20, p. 531*).

Inheritance of waxy endosperm in hybrids of Chinese maize, G. N. COLLINS and J. H. KEMPTON (*IV. Conf. Internat. Génétique Paris, Compt. Rend. et Raps., 1911, pp. 347-357*).—More detailed results are given of a series of crosses between Chinese corn with waxy endosperm and American varieties with horny endosperm, previously noted (*E. S. R., 29, p. 35*). "For the whole series of crosses the percentage of waxy seeds was 23.1, a deviation from the expected 25 of over 9 times the probable error.

"Where a Chinese variety with colorless aleurone was crossed with an American variety with colored aleurone, the second generation showed a coherence or positive correlation between waxy endosperm and colorless aleurone. Where the Chinese parent had a colored aleurone and the American parent was white, the positive correlation was between the opposite characters, waxy endosperm and colored aleurone. These results are interpreted as showing a definite tendency for characters that are associated in the parents to appear together in the later generations of the hybrids. Similar examples of coherence have been reported in the other crop plants, though this seems to be the first instance where the correlation is reversible."

See also a previous note by Collins (*E. S. R., 29, p. 633*).

Corn improvement (*Arkansas Sta. Bul. 115, pp. 549-574, figs. 14*).—The first portion of this bulletin, by C. V. Ruzek, discusses the buying, selection, and storing of seed corn; describes methods of germination tests; and points out good and poor characteristics of ears and kernels. The second portion, by

M. Nelson and C. V. Ruzek, describes 8 varieties of corn suitable for Arkansas conditions.

The shrinkage of shelled corn while in cars in transit, J. W. T. DUVAL and L. DUVAL (*U. S. Dept. Agr. Bul.* 48, pp. 21, figs. 8).—This bulletin reports a continuation of work already noted (*E. S. R.*, 25, p. 638). Data are given regarding 4 shipments of cars of corn loaded at Baltimore for Chicago, including percentage of moisture and sound corn, weight per bushel, percentage of cob, dirt, and badly broken kernels, temperature of corn when loaded and unloaded, and net weight.

The summary of the results of three of these experiments shows that the average natural shrinkage in 12 cars of corn in transit from Baltimore to Chicago and return amounted to 0.33 per cent, while in 12 duplicate cars held on the track at Baltimore it was 0.41 per cent. The average temperature at the time of unloading the corn in the 12 cars that were shipped was 60°, as against 64° F. for the cars held at Baltimore, this difference being accounted for by the fact that the temperature of the air through which the cars passed en route to Chicago and return was usually lower than that of the air surrounding the cars at Baltimore.

The authors maintain that there is unquestionably a natural shrinkage in commercial corn during transit and in storage, varying with the moisture conditions of the corn and the atmospheric conditions to which it is exposed. It is very rapid in corn that has become hot and sour, and may amount to several per cent within a few days.

Cotton breeding experiments and valuation of individual plants in cotton breeding, B. WUNDER (*Pflanzer*, 8 (1912), No. 7, pp. 398-411).—The author presents the following formula for placing a value on individual plants for use in making comparisons for breeding purposes:

$$V = \frac{\% \text{ of lint}}{2} + 2 \times \text{weight of 100 seeds} + \text{staple length} + 10 \times \text{average yield per boll.}$$

The formula employed to determine the relative growth of plants was as follows:

$$\text{Growth} = \frac{\text{number of branches} \times \text{length of stem.}}{2}$$

Tables are given showing the results of the application of these formulas to 365 individual plants grown in 10 different fields.

The inheritance of measurable characters in hybrids between reputed species of cotton, W. L. BALLS (*IV. Conf. Internat. Génétique Paris, Compt. Rend. et Raps.*, 1911, pp. 429-440, figs. 9).—In the crossing of cottons the author has made observations and collected data on the inheritance of a meristic character (number of loculi in the ovary), the weight of the seed, and the length of lint. His conclusions are that "the error from natural crossing is a serious obstacle to precise work on genetics in cotton. The behavior of the foreign pollen is closely analogous to that of a parasitic fungus. The pollen from the F_1 of reputed species-crosses has a higher infection-capacity than that of either parent. The correlation of one character with another causes new dimensional features to appear in the hybrids. The expression of any character is thus determined firstly by its gametic origin, secondly by simple fluctuation, and thirdly by 'autogenous fluctuation'. Even the simplest Mendelian inheritance, viz, the 3:1 ratio, may thus provide an F_2 in which the expression of the character is externally similar to simple chance distribution."

See also a previous note (*E. S. R.*, 28, p. 631).

Propagation of cotton by cuttings, G. CASTET (*Rev. Hort. Algérie*, 16 (1912), No. 5, pp. 144-148, figs. 4).—This article describes the methods employed by means of which herbaceous cotton branches were successfully grown under glass by cuttings or slips, as a means of multiplying an especially promising plant.

Variety tests with cotton, 1912, F. G. TARBON, JR. (*South Carolina Sta. Circ. 11, pp. 3, 4*).—This circular consists of a table giving yields per acre of seed cotton, percentage of lint, and length of lint in inches. Felkel, the variety producing the highest percentage of lint, 42.1 per cent, ranging from $\frac{5}{8}$ to 1 in. in length, was one of the best yielders, producing 1,518 lbs. per acre.

Cotton industry in Southern India, H. D. BAKER (*Daily Cons. and Trade Rpts. [U. S.], 16 (1913), No. 173, pp. 513-516*).—With the introduction of Cambodia cotton Southern India exports have more than doubled in quantity and more than trebled in value within the last decade, or since Tinnevely sorts were grown. It is noted that the Cambodia cotton flourishes as a heavily manured and irrigated crop. Conditions of manufacturing and the status of the industry are also discussed.

The fertility constituents in flax, J. W. INCE (*North Dakota Sta. Bul. 106, pp. 5-9*).—This paper contains data, compiled from various sources, showing that in equal weights "flax-seed contains over twice as much fertility as does the average of the 6 common grain crops cited; that flax-seed contains more manurial value than the highly nitrogenous oil-bearing seeds; that with the exception of potassium, flax-seed contains more fertilizing ingredients than do the seeds of the six legumes mentioned. Again, though flax straw contains less phosphorus and potassium than does the straw of legumes and grains, yet it occupies a position about half way between the latter two with regard to its nitrogen content.

The author believes that inasmuch as flax products are very rich in manurial constituents they should be carefully conserved on the farm.

On the origin of cultivated oats, L. TRABUT (*IV. Conf. Internat. Génétique Paris, Compt. Rend. et Raps., 1911, pp. 336-346, figs. 10*).—The author concludes that "at least 3 wild species of *Avena*, under the influence of culture, may acquire characters fitting them for cultivation. These 3 species preserve the ancestral characters by which they are adapted to different climates. "*A. fatua* gives rise to oats adapted to temperate and mountainous regions; *A. sterilis*, to oats adapted to the southern countries, and to saline soils; *A. barbata*, to races adapted to dry countries."

See also a previous note (E. S. R., 27, p. 237).

Studies in potato breeding, R. N. SALAMAN (*IV. Conf. Internat. Génétique Paris, Compt. Rend. et Raps., 1911, pp. 373-376*).—This article gives a résumé of previous work (E. S. R., 24, pp. 429, 632), with more recent results. The characters discussed are shape of tuber, the tuber eyes, color, and disease resistance. Results showed that the shape depended on the length character. "Superficial eyes" were found to be dominant over deep eyes, and color characters were found to follow Mendelian laws with certain compositions of reds and of purples or blacks with their developing pigment when selfed. "Upright" positions of growth were dominant over "proneness." Crossing for disease resistance had not been carried far enough for results. See also a previous note (E. S. R., 28, p. 632).

Experiments on the improvement of rice in Java by seed selection, J. VAN BREDA DE HAAN (*Bul. Écon. Indochine, n. ser., 16 (1913), No. 100, pp. 11-28*).—According to the appearance of the spikes found in some 6,400 samples, 2 groups were made, *Oryza sativa* and *O. glutinosa*. Treatment of the kernels of the 2 groups with a diluted solution of iodine produced a violet color on the surface of those from the *O. sativa* group, and a reddish-brown color in the *O. glutinosa* group. These groups were further divided into 4 varieties, viz, colored glumes, red awns, yellow awns, and awnless. Further divisions were made according to external characters until 751 varieties were obtained in the *O. sativa* group and 141 in the *O. glutinosa* group.

Careful and full data were kept of selections along pure lines resulting in pedigreed varieties grown in various parts of Java. The largest yield mentioned as attained was 6,611 kg. per hectare (5,884 lbs. per acre). Cross breeding is also mentioned as giving satisfactory results, especially with the first generation of hybrids.

The principles of paddy manuring, W. H. HARRISON (*Jour. Bd. Agr. Brit. Guiana*, 6 (1912), Nos. 1, pp. 37-40; 2, pp. 71-77).—From results of manurial tests with rice the following principles are laid down:

"Paddy soils need manuring with bulky organic manures which readily decompose under anaerobic conditions yielding humus. Nitrates are unsuited for the purpose, whereas ammoniacal manures or manures which yield ammonia under anaerobic conditions of fermentation are of great value. Nitrogen and phosphoric acid must be applied to all paddy soils, whereas potash should only be applied when the soil is in particular need of that ingredient."

The crops mentioned as used for green manures are *Sesbania aculeata*, *Crotalaria juncea*, *Tephrosia purpurea*, and *Phaseolus mungo*. Two methods of green manuring were employed, viz, turning under a green crop, and incorporating with the soil green leaves cut and brought from other areas. The latter is mentioned as being most efficient, as phosphorus is also added to the soil, while with a plowed-under crop phosphorus was added in the form of superphosphate. After the addition of green leaves as a fertilizer 4,490 lbs. of paddy and 5,811 lbs. of straw were obtained per acre, after green manure 4,200 lbs. paddy and 4,400 lbs. straw, and 3,392 lbs. paddy and 3,124 lbs. straw with no treatment. In another experiment an addition of 112 lbs. of superphosphate to green manure apparently increased the yield from 2,814 lbs. paddy and 2,691 lbs. straw, to 3,733 lbs. paddy and 4,043 lbs. straw per acre.

A study of the colors of the grain in rye, VON RUEMKE (*IV. Conf. Internat. Génétique Paris, Compt. Rend. et Raps.*, 1911, pp. 332-335).—"Selection according to the color of the grain, the yield, and the hardness, has been continued for 12 years, and the following facts have been established: In order to obtain pure races as regards grain color, selection should be continued for 7 or 8 years. The phenomenon of xenia occurs, as in maize. The color of the grain is a constant character. This color is produced by a pigment in the aleurone layer, next the epidermis. Those races (greenish-blue and yellow) which have hitherto been in commerce are satisfactory both for milling and baking. The different colors of the grain are correlated with other physiological and morphological characters; for instance, the greenish color appears to be connected with an increased tillering capacity and a shorter straw than the yellow colors. The great difficulty in maintaining the purity of a variety of rye, on account of the danger of cross-fertilization, is increased in direct proportion to the size of the neighboring plats of rye.

"The author believes that the possession of races pure as regards color supplies a criterion by which the occurrence of crossing will at once be visible in the grain, and that this will be a material aid in maintaining the purity of varieties of rye."

Soy beans, E. H. JENKINS (*Connecticut State Sta. Bul.* 179, pp. 3-13, figs. 4).—This bulletin briefly describes the soy-bean plant, its composition and yield as compared with some other crops, and its uses as silage, hay, green manure, seed, and hog pasture under Connecticut conditions.

It is noted that the best method of inoculation has been with 500 lbs. of soil per acre from a field where the crop has grown well. For seed production rows drilled 24 to 36 in. apart with seeds 2 to 4 in. apart in the row and for growing forage 1½ bu. seed per acre sowed with a grain drill is advised.

Buckwheat and cowpeas were grown under like soil conditions as soy beans for comparison of their value as cover crops and harvested at the same time with the following results:

Comparative yields per acre in 1913 of soy beans, cowpeas, and buckwheat.

Cover crop.	Total yield.	Water.	Vegetable matter.	Mineral matter.	Nitrogen.	Phosphoric acid.	Potash.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Soy beans.....	16,877	12,913	3,323	641	96	17	68
Cowpeas.....	19,597	16,515	2,522	560	72	11	72
Buckwheat.....	11,030	8,200	2,490	340	53	12	79

Other tables show analyses of soy-bean crops grown under various conditions.

[Field experiments with sugar cane], J. T. CRAWLEY (*Porto Rico Sugar Producers' Sta. Bul. 5* [English Ed.], pp. 5-21).—This report gives some results of fertilizer experiments with sugar cane, continuing previous work (E. S. R., 28, p. 423).

An average increase of 6.8 tons was harvested with the aid of complete fertilizers, and limed areas yielded better than unlimed. Trials showed the hole system of planting cane to be slightly superior in point of yield on a 2-year average than the furrow system. In distance planting it was noted that close (width between rows 4 ft.) planting gave larger yields, especially the first year, than wider (5 and 6 ft.) planting and reduced the cost of cultivation.

The results of cooperative tests of over 20 varieties of cane are reported. The report on seedling work covers the growing of about 2,000, and the analyses of about 300. The damage to roots, stalks, and leaves by insect pests is also noted.

Sugar-cane culture in Cuba, R. S. CUNLIFFE (*Cuba Mag.*, 3 (1912), No. 12, pp. 717-722, figs. 6).—This article describes the methods of producing sugar cane in Cuba on the 4 principal classes of soils, viz. red lands; black soils; brown, chocolate and mulatto soils; and savannah lands. The results of experiments at various places showed marked increased yields by the use of commercial fertilizers. Using 237 lbs. nitrate of soda, 95 lbs. sulphate of ammonia, 4,333 lbs. basic slag, and 114 lbs. sulphate of potash, there resulted a yield of 72,150 lbs. per acre, an increase of 59,683 lbs. over the unfertilized plat. On omitting the nitrogen the apparent increase was 60,666 lbs.; omitting the potash it was 61,534 lbs.; and omitting the phosphoric acid it was 41,816 lbs. per acre.

Seedling canes and manurial experiments, J. P. D'ALBUQUERQUE ET AL. (*Local Dept. Agr. Barbados, Seedling Canes and Manurial Expts., 1910-1912*, pp. 68).—This reports progress in sugar-cane work in continuation of that previously noted (E. S. R., 26, p. 837).

In an experiment to determine the deterioration of cut canes, 3 tons of White Transparent canes were cut from part of a field and so mixed together that 60 fairly uniform sample lots, each of 100 lbs. weight, could be drawn from the heap. Of these 60 bundles, 3 were crushed as soon as cut and the juice analyzed, 19 bundles (series A) were exposed to sun and air in the open, 19 bundles (series B) were covered with trash and left in the open, and 19 bundles (series C) were covered with trash and sprinkled with water once daily. The canes were cut on May 6 and 7, and each subsequent week day one bundle of canes from each of series A, B, and C was reweighed, crushed, and the juice analyzed.

"In series A, at the end of 3 days, besides a decrease of $8\frac{1}{2}$ per cent in weight, the purity of the juice began to diminish and the glucose ratio to increase, showing that inversion had begun. The next 3 days keeping did not show further diminution in weight, but after 4 days (from the beginning of the experiments), the diminution in purity was considerable and sufficient to affect the manufacturer's yield. These changes continued in the same direction until the seventh day, and from the seventh day onward with greater rapidity, rendering the canes of small value to the manufacturer of sugar, and of diminishing value to the manufacturer of sirup."

With series B no noteworthy change took place until after 4 days, and in series C purity was maintained until the fifth day, after which it decreased rapidly. Tabulated results are given.

Report of the agricultural work for the season between 1909-1911, J. P. D'ALBUQUERQUE and J. R. BEVELL (*Rpt. Agr. Work Barbados, 1909-1911, pp. 105*).—This report includes brief notes and results of continued work (E. S. R., 26, pp. 836, 837), mostly reported in local publications.

Sweet clover, C. C. CUNNINGHAM (*Kansas Sta. Circ. 34, pp. 6, fig. 1*).—This circular discusses the value of sweet clover in Kansas and gives directions for its production, covering the topics of preparing the seed bed, seeding, inoculating, handling sweet clover for hay, saving the seed, and sweet clover as a pasture crop and as a soil improver.

Soy beans and cotton as preparatory crops for tobacco, F. DE FREMERY (*Meded. Deli-Proefstat. Medan, 7 (1912), No. 1, pp. 57, 58*).—The results of these experiments were unfavorable. The soy bean plat produced 248,650 leaves of tobacco as compared with 266,800 on the control plat, and the cotton plat produced 95,700 leaves as against 107,350 on the control plat.

On hybrids of *Triticum* with *Ægilops* made in the year 1856, P. DE VILMORIN (*IV. Conf. Internat. Génétique Paris, Compt. Rend. et Raps., 1911, pp. 317, 318, fig. 1*).—The author reports that he has lately discovered at Verrières some ears arising from the cross made by his grandfather in 1856 between *Triticum sativum* and *Ægilops ovata*. This cross has been made many times since, but this appears to be the only occasion on which it has succeeded. Ten hybrid plants were obtained, from the seeds of which 25 plants were raised in the year 1858. Fifteen of these plants were from *A. ovata* crossed with the wheat Blanc de Flandre. The plants varied considerably among themselves, and in the following year only 1 plant was raised, which produced no seed.

A fertile hybrid of wheat and rye, F. JESENKO (*IV. Conf. Internat. Génétique Paris, Compt. Rend. et Raps., 1911, pp. 301-311, figs. 12*).—Plants of F_1 , F_2 , and F_3 resulted from an artificial cross between Mold-squarehead wheat and Petkus rye. It is noted that F_1 and F_2 plants seem to be perennial.

The fixity of races of wheat, P. DE VILMORIN (*IV. Conf. Internat. Génétique Paris, Compt. Rend. et Raps., 1911, pp. 312-316, figs. 3*).—The author draws attention to the often repeated assertion that climatic conditions may possess a modifying influence on varieties of wheat. He does not agree with this opinion, but considers that the influence of climatic conditions is limited to the suppression of unadapted forms. On finding in the laboratory of Louis de Vilmorin a collection of ears of the cultivated varieties of wheat grown at that period (1837-1855), he compared these ears with those harvested from the same varieties in 1908-1910, and found that they were identical in all respects, although separated by an interval of 50 years during which annual selection had been continued.

"This fixity is shown not only in the characters of the ear, but also in all the other characters of the plant, even that of precocity, which would appear to be most dependent on climate."

Tests of varieties of wheat, C. F. NOLL (*Pennsylvania Sta. Bul.* 125, pp. 43-56).—This bulletin includes the results of tests of about 30 varieties of wheat covering the years 1910 to 1913, inclusive. It is noted that 5 of these varieties have been in tests continually for 23 years. The yields in 1910 ranged from 15.7 to 33 bu., in 1911 from 20.3 to 39.2 bu., in 1912 from 15.7 to 26.4 bu., and in 1913 from 18.9 to 44.1 bu. per acre. The average yields of the 3 best yielding varieties for 1909 to 1913, omitting 1910, were Dawson Golden Chaff 32.3 bu., Turkish Amber 32.2 bu., and Fulcaster 29.7 bu. per acre.

Tabulated data include weights per measured bushel; average yields for periods of 3, 5, 8, 10, 11, 12, 13, 15, 16, and 22 years, respectively; and descriptions of varieties tested.

The seed control act, H. L. BOLLEY (*North Dakota Sta. Spec. Seed Bul.* 2, pp. 3-16, figs. 2).—This bulletin contains the text of the North Dakota pure seed law of 1913, with comments and notes thereon, and some instructions for collecting and sending samples of seed to the state seed commissioner.

A ready reckoner for grain buyers.—Wagonloads of various grains reduced to bushels and pounds, also wheat dockage (*Minneapolis, Minn., 1913, 2. cd., pp. 68*).—This publication presents figures showing wagonloads of various grains reduced to bushels and pounds, also wheat dockage, extending in weights up to 100,000 lbs.

HORTICULTURE.

[Report of botanical investigations], B. D. HALSTED ET AL. (*New Jersey Stas. Rpt. 1912, pp. 349-402, pls. 26*).—Inheritance studies of various crosses of sweet, pop, and flint varieties of corn (E. S. R., 28, p. 739) were continued in 1912. The transmission of texture and color in the progeny of these crosses is discussed. In one block of corn it was observed that the dark seed from the husk or cobless variety which had been pollinated with Black Mexican yielded corn growing on more or less perfect cobs. Individual grain husks were present but were sufficiently reduced in many cases to expose the grains of corn. Isolated grains of corn growing on poorly-developed ears from various crosses were found to be somewhat larger and heavier than grains from well-developed ears, but the specific gravity of these grains was only slightly increased. Attention is called to the fact that in a mixed ear of corn the sugary grains may be distinguished from the flinty grains by their more elevated position, as compared with the adjacent flinty grains. This may be noticed as soon at least as the ears are ready for the table. A study of the zigzag and irregular types of corn, such as Banana and Country Gentleman, shows that there is a normal 2-row arrangement of the unfertilized ovules and that the irregular arrangement is due to the lack of pollination of many ovules in each row. Ovule fertilization appears to take place from a midzone on the ear and to proceed toward the base and tip. The possible value of this fact in making selections for earliness and greatest vigor is pointed out. A preliminary test relative to germination of corn indicates that the slender epicotyl can accommodate itself readily to various planting depths and position of the seed in the soil.

Forty-eight F_1 crosses of peppers studied by the author are here discussed in part with reference to character transmission. Considerable variations in size and shape of peppers growing on the same plant were noted. Variation in shape within the variety appears to be due to the extent to which the placenta fills the cavity and to the more or less regular development of seed over the surface of the placenta. Size of fruit within the variety is governed largely by more or less perfect nutrition. Late maturing peppers within a variety are more nearly uniform in size than the early maturing peppers.

A brief study of several kinds of beans with reference to relation of position in pods to weight and desirability of the seed is reported on page 331, and hypocotyl studies with various plants on page 331, together with a preliminary study of shade as influencing the growth of plants in the open, and weather notes for the growing season.

Report of progress, B. H. A. GROTH (*New Jersey Stas. Rpt. 1912, pp. 403-407, pls. 6*).—A summary is given of the previous detailed report on the F₁ heredity of fruit characters in the tomato (E. S. R., 27, p. 742), together with a brief statement of work done with the F₂ and F₃ generations during 1912. The selection of many-celled and 2-celled fruits in the prairie berry (E. S. R., 28, p. 739) was continued. From the records secured at the time this report was prepared, however, high cell number does not appear to have been transmitted to the offspring from many-celled fruits selected in 1911.

Some additional data are given relative to the effect of various chemicals on plants, although no deductions are made at this time.

In the summer of 1909 some preliminary tests were made with various plants in the summer heat of the greenhouse to determine which plants might be favorable subjects for testing the permanency of environmental influence upon characters of habit. Among other plants 4 varieties of bush beans were tested. A decided change of habit attributed to excessive heat was produced in two of these varieties, both of which began to run up to a height of 6 to 8 ft. on strings like pole beans. No change in habit could be induced by the same treatment with the other two varieties during the course of three generations. Pods were taken at various heights from several plants of the varieties which had been converted into climbers, and the seeds of each pod were grown separately in the following summer under the same conditions. The seeds from the same plant, all perfectly mature, developed into plants of different heights. In the work as thus far continued, however, no direct relation has been traced between height of seed on the parent plant and maximum height in the offspring.

In previous studies of circulation in the sweet potato vine it was found that a reversed water current coming from parts of the vine fruited in favorable situations was able to keep the sweet potato leaves perfectly turgid (E. S. R., 27, p. 731). An experiment, which is here outlined, is now under way to determine whether it is also possible to reverse the current of assimilated food materials.

A study of inheritance in garden plants, E. J. OWEN (*New Jersey Stas. Rpt. 1912, pp. 408-417, pls. 6*).—The work in 1912 was conducted along the lines noted in the previous year (E. S. R., 28, p. 740). Some general notes are given on first generation crosses of beans, together with some data on crosses and hybrids of eggplants. The yield limitation experiments with various vegetables were continued.

Some data on this work are reported for bush beans, eggplants, and tomatoes. Aside from the results previously noted (E. S. R., 27, p. 741) there appears to be a greater development of blossoms on plants which are the progeny of plants which have borne only one fruit as compared with those which have borne a full crop.

American-grown paprika pepper, T. B. YOUNG and R. H. TRUE (*U. S. Dept. Agr. Bul. 43, pp. 24, figs. 11*).—This bulletin reports the results of an experiment undertaken to determine the feasibility of growing the Hungarian paprika type of red pepper in this country. Introductory considerations deal with the history of paprika peppers, legal definition of paprika, botanical origin of paprika, characteristics of American paprika as compared with the foreign product, and commercial considerations. The cultural experiments which were carried out in South Carolina are here discussed with reference to the prevailing climatic

and soil conditions, propagation, preparation of seed bed, field planting, cultivation, fertilizers, harvesting, curing, storage, yield, financial returns, and outlook for the future.

Generally speaking it appears that there are no special cultural difficulties to be met with in growing paprika peppers in favorable locations in this country. The experimental crops grown by the Department have been harvested with a favorable margin of profit. On the other hand, until a larger market is developed for the product the planting of paprika peppers can be easily overdone.

Report of the horticulturist, M. A. BLAKE and A. J. FARLEY (*New Jersey Stas. Rpt. 1912, pp. 69-96, pls. 5*).—A brief general statement is given of progress made on various projects in 1912, together with data on the time of spraying, materials used, and cost of spraying in the Vineland peach orchards; harvesting dates of various apples at the college farm for the years 1908 to 1912, inclusive; a discussion of the nature of winter injuries to fruit trees noted on page 352; a brief account of the division's new range of greenhouses; and a description of experimental lime tests with My Maryland and Killarney roses.

An analysis of the harvesting dates of apples shows a considerable difference in the actual date of ripening of the various varieties in certain seasons and leads to the conclusion that fruit should be picked according to its actual maturity rather than at fixed dates.

In lime tests with greenhouse roses two varieties, My Maryland and Killarney, were grown in bench plats, each containing 15 sq. ft. of surface. Two plats were kept as checks; two plats each received 270 gm. of ground calcium limestone; and two plats each received 810 gm. of limestone when the plants were benched in the spring of 1910. All of the plats received the same general fertilizer treatment. Notes and data are given on the condition of the plats up to the fall of 1912, when the seventh crop of roses was gathered and the experiment discontinued. As indicated by the total yields of all the plats for the entire experiment, the unlimed plats show a smaller number of flowers of all grades (with one exception) of both My Maryland and Killarney than the plats receiving 270 gm. of limestone, and the plats receiving 810 gm. of limestone produced more flowers of all grades than the plats receiving 270 gm. of limestone. Killarney appeared to suffer much more from the increasing acidity in the soil than My Maryland. In addition to reducing the number of flowers the lack of lime appeared to reduce the length and vigor of the stems and leaves. The color of the flowers on the slightly acid plats was somewhat heightened, but when the growing shoots became very slender and weak the flowers were very light in color. From the results thus far secured it is believed to be advisable to apply annually at least 270 gm. of ground limestone to each 15 sq. ft. of bench surface, and that heavier applications may be beneficial and desirable with certain soil types, varieties, and methods of culture. Some extended studies with lime in the culture of roses are now being conducted.

Orchard spraying, W. H. ALDERMAN, N. J. GIDDINGS, and W. E. RUMSEY (*West Virginia Sta. Circ. 7, pp. 48, figs. 33*).—This circular discusses the use of spray machinery, preparation of sprays, and spray material, and briefly describes the more important diseases and insects of orchards and vineyards, including suggestions for their control.

Rational methods of pruning grapes, V. C. M. DE ZÚÑIGA (*Prog. Agr. y Pecuario, 19 (1913), Nos. 832, pp. 483-485; 833, pp. 501-504*).—A discussion of various methods of pruning grapes, with special reference to the reconstitution of phylloxera-infested vineyards, based largely on observations made in the experimental field of the enological station at Haro, Spain.

Factors governing the successful storage of California table grapes, A. V. STUBENRAUCH and C. W. MANN (*U. S. Dept. Agr. Bul. 35, pp. 31, pls. 8, figs. 7*).—This bulletin summarizes the table grapes storage investigations which have been conducted during the seasons 1906 to 1912, inclusive, special attention being given to the successful packing, storing, and marketing tests during the seasons of 1911-12 and 1912-13.

The commercial demonstrations during the two seasons, as well as the records of the Department's investigations during the whole period, show that the method of packing California table grapes with a filler of redwood sawdust and of holding them in cold storage for the holiday market is destined to form one of the successful practices of the grape industry of the State. Inasmuch as the holiday crop must compete with Spanish grapes, only fruit of the best quality should be handled in this way, those varieties which have open bunches being the most suitable for packing in redwood sawdust. The drum barrel has been found to be the most satisfactory package for grapes packed in redwood sawdust. The sawdust should be pure and unmixed with other woods and enough filling material should be used to prevent settling. The fruit should be cooled over night in the vineyard or precooled before the packages are loaded into the cars. It should be shipped under refrigeration and placed in cold storage at 32° F. immediately upon reaching its destination.

Under conditions of careful handling, packing, and storing Emperor grapes may be held in cold storage until about January 10; the Malaga variety until December 15; and the Muscat until November 15. When Almeria grapes can be grown successfully in California for commercial purposes they may be held in cold storage until about April 1.

The banana, R. U. URIBE (*Rev. Indus. y Agr. Tucumán, 3 (1912), Nos. 1, pp. 37-44; 2, pp. 71-89; 3, pp. 133-135; 4, pp. 161-181; 5, pp. 209-227; 6, pp. 261-273*).—A paper on the banana presented before the Agricultural Society of Colombia in which the author discusses the history, distribution, botany, uses, and commerce of the banana, including data on the cost of establishing plantations and the returns which may be expected.

The banana, R. DE CASTRO (*Bol. Min. Agr., Indus. e Com. [Brazil], 2 (1913), No. 4, pp. 127-140*).—An account of the banana with reference to its botany, origin, species and varieties, climatic and soil requirements, uses, commerce, and Brazilian exports.

Spraying walnut trees for blight and aphid control, R. E. SMITH, T. F. HUNT, and W. H. NIXON (*California Sta. Circ. 107, pp. 8*).—In some earlier experiments conducted by the station (*E. S. R., 28, p. 349*) it was found impractical to spray large walnut trees for the control of blight on account of the time and expense required by ordinary spray methods. In the experiments here described a considerable acreage of large walnut trees was sprayed, various methods and mixtures being used. It was found that the problem of spraying such large trees quickly and economically was met by the use of high-power sprayers and a special nozzle, previously noted (*E. S. R., 26, p. 49*), making it possible to cover the largest trees completely from the ground. The amount of material required for spraying good-sized trees thoroughly averaged from 30 to 50 gal. per tree and the average total cost of spraying per tree was about 55 cts.

The results of the spraying upon walnut blight were difficult to establish on account of the slight occurrence of the disease in the sprayed districts during the season. Well-sprayed trees remained comparatively free of aphid long after the insect had become abundant on unsprayed trees, and the improved condition, as well as the increased growth of the trees, nuts, and foliage, seemed to justify the cost of spraying, notwithstanding the fact that

the aphids finally spread from the unsprayed trees to some extent to the trees which were sprayed. The best results were secured with a mixture comprised of 5 gal. of commercial lime-sulphur solution, 25 lbs. of quicklime, and 95 gal. of water. The spraying should be done while the trees are still dormant, since the solution burns the foliage severely.

Rules and regulations of the South Carolina Crop Pest Commission governing the transportation of nursery stock.—Definition of nursery stock (*South Carolina Sta. Circ. 14, pp. 4*).—In addition to the text of the rules and regulations governing the transportation of nursery stock instructions are given for the fumigation of nursery stock originating in South Carolina, as well as the forms of certificates used by the State Crop Pest Commission.

Rules and regulations of the South Carolina Crop Pest Commission governing the transportation of bulbs, tubers, and roots (*South Carolina Sta. Circ. 17, p. 1*).—The regulations here given deal specifically with shipments from without the State of sweet potatoes, Irish potato tubers, onion bulbs, and strawberry roots.

Rules and regulations of the South Carolina Crop Pest Commission governing the transportation of seeds other than cotton (*South Carolina Sta. Circ. 18, pp. 3*).—The text of the rules and regulations is given.

FORESTRY.

Silviculture (*X. Cong. Internat. Agr. Gand, 1913, Sect. 5, pp. [218], fig. 1*).—A report of the proceedings of the silvicultural section of the Tenth International Congress of Agriculture, at Ghent, 1913, including résumés and in some cases full reports of various papers presented. See also a previous note (*E. S. R., 29, p. 105*).

The distribution of forests in the natural regions of Switzerland, M. DECOPPET (*Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 4 (1913), No. 12, pp. 1822-1825*).—A brief descriptive account of the forest character of the Jura, the Plain, and the Alps divisions of Switzerland.

Extension of the Mexican forest flora to the plateau country of South Africa, D. E. HUTCHINS (*Quart. Jour. Forestry, 8 (1914), No. 1, pp. 16-20*).—Notes are given on the adaptation of a number of Mexican trees to the plateau country of South Africa.

The Chinese arbor vitæ (*Thuya orientalis*), C. A. SCOTT (*Kansas Sta. Circ. 33, pp. 6, figs. 3*).—A brief descriptive and cultural account of this tree, with special reference to its use in western Kansas as a windbreak and for ornamental plantings. Wherever the tree has been planted in Kansas it is making a very successful growth, having withstood the climatic conditions the past 18 or 20 years without serious injury.

Cottonwood in the Mississippi Valley, A. W. WILLIAMSON (*U. S. Dept. Agr. Bul. 24, pp. 62, pls. 6, fig. 1*).—This bulletin reports a special study made of cottonwood to determine more definitely its characteristics and the general practicability of forest management. Although the conclusions reached apply chiefly to the Mississippi Valley region, those in regard to planting are applicable wherever cottonwood can be grown.

The subject matter is discussed under the following general headings: Annual cut and present supply, character of the wood, uses, stumpage values and logging costs, range, botanical characteristics, silvical characteristics, character of stands, form and growth of individual trees, growth and yield of stands, management, returns from growing cottonwood, and planting.

An analysis of the data secured indicates that cottonwood plantings will yield at least 6 per cent on the investment. Cottonwood grows rapidly and can

be cut for pulpwood when 15 years old and for timber and veneer in 35 years. To the owner of unprotected bottom land it should appeal as a profitable tree to grow in the region, especially on the extensive areas outside the river levees.

Osier culture, H. LATIÈRE (*La Culture de l'Osier*. Paris, 1912, pp. 122, pls. 3).—A practical guide to the establishment, care, and management of osier plantations, including also information relative to the preparation and marketing of the osiers.

The rosewood of Guiana and its essential oil, E. BASSIÈRES (*Le Bois de Rose de la Guyane et son Huile Essentielle*. Paris, 1913, pp. 41, figs. 9).—A botanical study of the rosewood (*Licaria guianensis*), including an account of the distillation of rosewood oil. A note by A. Berteau is also given on the macroscopic, histologic, and microchemic characters of the rosewood.

Rubber and rubber planting, R. H. LOCK (*Cambridge, England, 1913*, pp. XIII+245, pls. 10, figs. 22).—This is an introductory treatise on the subject, in which the author discusses the history of the use and cultivation of rubber, the botanical sources of rubber, the physiology of latex production and tapping experiments, planting operations, harvesting, factory work on the estate, the pests and diseases of *Hevea*, the cultivation of species other than *Hevea brasiliensis*, the chemistry of india rubber, and the manufacture of rubber goods.

Annual return of statistics relating to forest administration in British India, 1911-12 (*Statist. Forest Admin. Brit. India, 1911-12*, pp. 27, pl. 1).—The statistics here reported deal with alterations in forest areas, progress in forest settlements, forest surveys and forest working plans, forest protection, planting operations, yields in major and minor forest products, revenues, expenditures, etc. Statistical diagrams indicating some results of forest administration in British India are appended.

Annul report of the director of forests, N. W. JOLLY (*Ann. Rpt. Dir. Forests [Queensland]*, 1912, pp. 5).—This is a report for the calendar year 1912 relative to the administration and management of the state forests and national parks in Queensland, including data relative to forest areas, revenues, expenditures, etc.

The estimation of accretion in forest management systems, G. BAADER (*Die Veranschlagung des Zuwachses bei Waldertragsregelungen*. Inaug. Diss., Univ. Giessen, 1913, pp. 57, fig. 1).—A doctorate dissertation on this subject presented to the philosophic faculty of the University of Giessen.

A new dendrometer or timber scale, J. F. CLARK (*Forestry Quart.*, 6 (1913), No. 4, pp. 467-469, pl. 1).—The dendrometer here described and illustrated is a direct reading instrument, both as regards the height and diameter measurements of the tree.

The air-seasoning of timber, W. H. KEMPFER (*Bul. Amer. Ry. Engin. Assoc.*, 15 (1913), No. 161, pp. 161-231, figs. 63; *abs. in Engin. Rec.*, 69 (1914), No. 2, p. 53).—In the present paper the author has collected the data on air-seasoning which has appeared in various circulars and bulletins of the Forest Service of the U. S. Department of Agriculture and has arranged them, together with data secured elsewhere, so that the results of various tests are comparable with one another.

The development and status of the wood-preserving industry, E. A. STERLING (*Sci. Amer. Sup.*, 76 (1913), No. 1958, pp. 24-27, figs. 9).—Notes and illustrations on the art as practiced in America are presented.

DISEASES OF PLANTS.

The fungi which cause plant disease, F. L. STEVENS (*New York, 1913*, pp. IX+754, figs. 449).—This book is intended as an introduction to the study of the more important cryptogamic parasites that affect economic plants in the

United States and supplements the volume by Stevens and Hall on Diseases of Economic Plants (E. S. R., 24, p. 345), in which the authors describe the gross characters of various diseases.

In the present publication technical descriptions are given of the different fungi, and keys presented whereby the student can determine the specific relationship of any parasite known to occur on economic plants in the United States. Some species have been included that have not been reported as present in this country and some nonparasitic ones are included in the keys, but no attempt has been made to give complete lists of all of them. The arrangement of the material is by orders, beginning with the slime molds, Myxomycetes, and running through the Schizomycetes and true fungi, the Eumycetes.

Extensive bibliographies are given at the end of the various groups, and a list of books and periodicals that are thought to be useful for students of plant diseases is also included.

Report on economic mycology, E. S. SALMON (*Jour. Southeast. Agr. Col. Wye, 1912, No. 21, pp. 321-404, pls. 25, figs. 8*).—Reports are given of observations on miscellaneous plant diseases, celery blight and its prevention, some spraying experiments for the control of apple scab, and notes on the American gooseberry mildew. In addition the author and assistants report on the Cytophora disease of the cherry (see p. 352), experiments with *Rhizopus nigricans* on tomatoes (see p. 351), and a new disease of apple buds (see p. 352), as well as on the lime-sulphur wash for use on gooseberries, previously noted (E. S. R., 29, p. 249).

Among the miscellaneous diseases reported upon, attention is called to the crown gall of alfalfa due to *Urophlyctis alfalfa*, a number of minor diseases of fruits, and tomato canker due to *Botrytis*, the superficial appearance of which resembles that caused by *Mycosphaerella citrullina*. In a previous publication (E. S. R., 23, p. 337) attention was called to the advantage of the presence of male hops in the control of hop mildew. Subsequent investigations have confirmed the previous conclusion that by the fertilization of the hop the growing out is hastened and the critical period when the hops are subject to mildew is shortened.

Experiments are reported on the spraying of celery for the prevention of the blight due to *Septoria petroselini apii*, from which it is concluded that three sprayings with home-made Bordeaux mixture, 4:4:50, will protect celery plants during the growing period. As the disease is liable to occur early in the season it is recommended that seedling plants be dipped in Bordeaux mixture at the time of transplanting.

For the control of apple scab, experiments were conducted on the use of Bordeaux mixture, lime sulphur, and iron sulphid as fungicides. Comparisons were also made between Bordeaux mixture (4:4:50) and the Woburn mixture, which is a greatly diluted form of Bordeaux mixture. It was found that for most varieties of apples home-made Bordeaux mixture could be successfully employed for the control of the scab, although it has proved injurious to some varieties. The Woburn Bordeaux mixture did not prove as effective as the ordinary Bordeaux mixture. Lime sulphur as a fungicide was found to check slight attacks of scab, but attention must be paid to the strength of the solution, many varieties being injured where the specific gravity was 1.01. For varieties known to be subject to injury, it is recommended that lime sulphur with a specific gravity of 1.005 be tried. The self-boiled lime sulphur and iron sulphid wash gave some very satisfactory results, and it is thought that this is worthy of further trial. The self-boiled lime sulphur and copper sulphid preparation is also believed worthy of further test.

The author reviews the present state of affairs regarding the spread of the American gooseberry mildew (*Spharotheca mors-uvæ*) in Kent. It is stated that there are 3,294 acres of infected gooseberries in Kent, as compared with 2,561 acres the previous season. This spread has been in spite of the efforts that have been carried on to control the disease, indicating that compulsory measures have no appreciable effect in clearing plantations of the disease.

A brief account is given of a disease of tomatoes due to *R. nigricans*. This trouble appeared on fruit after shipment, causing considerable loss. The fungus appears to be a facultative parasite and causes a softening and rotting of the fruit.

Report of the plant pathologist, M. T. Cook (*New Jersey Stat. Rpt. 1912*, pp. 509-527).—A summary is given of the work conducted by the department of plant pathology, which was organized under the author's direction in December, 1911. The work consists of inspection of nursery stock, orchards, and imported plants. Some studies have been made on chestnut bark disease, and investigations have been begun on peach yellows, sweet potato diseases, apple rots, and a storage rot of dahlias. The report concludes with a list of diseases reported during the year.

Report on the work of the division for plant protection, C. BRICK (*Jahrb. Hamburg. Wiss. Anst.*, 29 (1911), *Beihft 10*, pp. 233-254).—Brief accounts are given of diseases and animal enemies of plants reported during 1911-12 from German territory and from many other parts of the world, with more particular reference to those in portions of Germany proper, concluding with an index of injurious organisms noted in this connection.

Review of vegetable pathology (*Ann. Uff. Agr. Prov. Bologna*, 18 (1911-12), pp. 194-197).—A brief account is given of observations on injurious animals and fungi, in particular *Ophiobolus graminis* and *O. herpotrichus*, associated with stalk disease of wheat. Tabulated results are presented of reports made by several agriculturists in different localities regarding their observations on time and conditions of attack, susceptibility of varieties, effects of fertilizers, etc.

Recommendations made as to protective measures include application of fungicidal mixtures to infected stubble; rotation of crops; avoidance of excess of nitrogenous manures, also of very thick sowing; and suitable drainage.

A bibliography of mycological literature, G. LINDAU and P. SYDOW (*The-saurus litteraturæ mycologicæ et lichenologicæ ratione habita præcipue omnium quæ adhuc scripta sunt de mycologia applicata. Leipsic, 1912, vol. 3, pt. 1, pp. 1-192; 1913, vol. 3, pt. 2, pp. 193-766+IV*).—This is in continuation of the bibliographies of mycological literature previously noted (*E. S. R.*, 22, p. 133), the present volume covering the publications from 1907 to 1910, with additions and corrections to previous issues. The number of titles included in volume 3 is 12,120, and the total number of references listed in the three volumes issued to date is 41,860.

Some new or rare plant diseases, L. MONTEMARTINI (*Riv. Patol. Veg.*, 6 (1913), No. 7, pp. 204-210).—The author gives brief notices of studies on some diseases and enemies of cultivated plants made or reported at the laboratory for plant pathology at Milan, including *Cladosporium cucumerinum*, damaging cucumbers; a leaf spot of Iris, ascribed to a Septoria; *Botrytis vulgaris*, parasitic on camellias; *C. pisi*, on kidney beans, etc.

A bacterium causing a disease of sugar-beet and nasturtium leaves, NELLIE A. BROWN and CLARA O. JAMIESON (*U. S. Dept. Agr., Jour. Agr. Research*, 1 (1913), No. 3, pp. 189-210, pls. 3, figs. 5).—In 1908 a bacterial disease was observed on nasturtium leaves growing near Richmond, Va., and a similar disease

on sugar-beet leaves from Garland, Utah. At the time of their recognition there is said to have been no thought of a possible relationship between the causal organisms, but subsequent studies, which have been extended to cover over four years, have shown that in essential characteristics the bacterial organisms are so nearly identical that they are considered by the authors to be the same species.

The occurrence and general appearance of the disease on the two host plants are described, and the results of numerous infection experiments are given. The morphological and cultural characters of the organism are presented in detail, and the bacterium held responsible for this disease is described as a new species, the name *Bacterium aptatum* being given it.

In addition to causing leaf spot disease of sugar beet and nasturtium, the organism was found infectious to bean leaves and pods, lettuce, pepper, and eggplant. It is considered probable that infection takes place through wounds, or by means of insect injuries, and that it may be spread by insects.

The organism belongs to the green fluorescent group and differs from *B. xanthochlorum*, which is pathogenic to the potato, and from *Pseudomonas tenuis*, which has been described as occurring in the sap of the maple tree (E. S. R., 29, p. 157). It also differs from *B. phaseoli*, although both organisms produce spotting on the leaves and pods of the bean.

The rusts of Nova Scotia, W. P. FRASER (*Proc. and Trans. Nova Scotian Inst. Sci.*, 12 (1909-10), No. 4, pp. 313-445, figs. 24).—The results are given of field and microscopic studies of the rusts of Nova Scotia, about 100 species being described. Particular attention is paid to the economic aspect of the different rusts, their heterecism, etc. A bibliography is included.

Internal æcia, F. A. WOLF (*Mycologia*, 5 (1913), No. 6, pp. 303, 304, pl. 1).—The author describes internal æcidia of *Puccinia angustata*, which, while common, are not considered the normal fructifications in this plant.

On the temporary suspension of vitality in the fruit bodies of certain Hymenomycetes, A. H. R. BULLER and A. T. CAMERON (*Proc. and Trans. Roy. Soc. Canada*, 3. ser., 6 (1912), Sect. IV, pp. 73-78).—Studies carried out since the publication by Buller of his *Researches on Fungi* (E. S. R., 22, p. 542), are said to show that dried fruit bodies of *Daldalea unicolor*, exposed in darkness to air at room temperatures, can retain their vitality for at least 7½ years, and those of *Schizophyllum commune* under similar circumstances for at least 5 years and 7 months; that the latter under similar conditions, except that they were thoroughly dried and kept at a pressure in this instance of less than 0.1 mm. of mercury, retained vitality for more than 16½ months; and that in general as regards retention of vitality when dried, exposed to ordinary air, or kept in vacuo, the fruit bodies of certain Hymenomycetes resembled in behavior the seeds of higher plants and the spores of molds.

Upon the retention of vitality by dried fruit bodies of certain Hymenomycetes, including an account of an experiment with liquid air, A. H. R. BULLER (*Brit. Mycol. Soc. Trans.*, 4 (1912), pt. 1, pp. 106-112).—Briefly reviewing the above work, the author adds an account of later experiments by himself, in which it was found that fruit bodies of *Schizophyllum commune*, after having been kept dry in exposure to air for 2 years and 8 months and subsequently dried in a vacuum and subjected to the temperature of liquid air for 3 weeks, retained their vitality. From this he concludes that there must be in this instance a temporary suspension of vitality, as claimed in case of seeds and spores studied by Becquerel (E. S. R., 21, p. 726; 23, p. 721).

Recent studies on parasitism of *Gnomonia veneta* on *Platanus*, A. TONELLI (*Riv. Agr. [Parma]*, 19 (1913), Nos. 40, pp. 626-629, fig. 1; 41, pp. 643-645).—As a result of studies and observations briefly noted, the author concludes

that *Microstroma platani*, as described by Eddelbüttel and Engelke (E. S. R., 28, p. 652), and *Glæosporium nervisequum* are stages of *G. veneta*.

Contributions on imperfect fungi, I, II, H. KLEBAHN (*Mycol. Centbl.*, 3 (1913), Nos. 2, pp. 49-66, figs. 13; 3, pp. 97-115, figs. 19).—The author concludes from the comparative study of a fungus found on dahlias that it is not identical with *Verticillium albo-atrum*. Of three fungi studied in connection with *Darlingtonia californica*, one is said to be new and is named *Glæosporium darlingtonia*, the second is not settled as to relationship, and the third is said to belong to the morphological type *Pestalozzia versicolor*.

A new nematode fungus, P. LINDNER (*Deut. Essigindus.*, 17 (1913), No. 49, pp. 465-468, pl. 1).—A brief account with illustration is given of studies by the author on a fungus invading the alimentary canal of *Anguillula aceti*, which is finally killed by the parasite. The latter is said to be closely related to *Fusarium*, but the author has designated it provisionally as *Rachisia spiralis* n. g. and sp. The possibility of combating nematodes by means of some such natural enemy is suggested.

Some important diseases of field crops in North Carolina, H. R. FULTON and J. R. WINSTON (*Bul. N. C. Dept. Agr.*, 34 (1913), No. 4, pp. 24, figs. 12).—Popular descriptions are given of the more important diseases of alfalfa, clover, corn, cotton, cowpeas, cereals, tobacco, etc.

Two new grass smuts, E. MACKINNON (*Jour. and Proc. Roy. Soc. N. S. Wales*, 46 (1912), pt. 2, pp. 201-204, pls. 4).—Descriptions are given of *Sorospodium panici* on *Panicum flavidum* and *Ustilago panici-gracilis* on *P. gracile*.

Experiments in combating stinking smut of winter wheat, H. C. MÜLLER and O. MORGENTHAUER (*Fühling's Landw. Ztg.*, 62 (1913), No. 14, pp. 481-487).—Details are given and results tabulated of about 50 experiments with different treatments for stinking smut.

Deep planting (8 cm.) reduced somewhat the smut attack. The caustic potash and the nitric acid treatment gave favorable results and are to be further tested. It is stated that immersing the seed grain for 10 minutes in water at 55° C. has been found fully protective without lowering the percentage of germination.

Erysiphe polygoni on leaves of beet, G. NEVODOVSKII (*Viestnik Tifliss. Bot. Sada*, 1913, No. 26; *abs. in Riv. Patol. Vcg.*, 6 (1913), No. 6, p. 180).—The author reports finding on beets at an experimental farm in the district of Tiflis a fungus agreeing closely, as regards morphology, with *E. polygoni*. It was suspected after further study to be a biologically specialized form of that fungus.

Foot rot, a new disease of the sweet potato, L. L. HARTER (*Phytopathology*, 3 (1913), No. 4, pp. 243-245, figs. 2; *U. S. Dept. Agr., Jour. Agr. Research*, 1 (1913), No. 3, pp. 251-274, pls. 6, fig. 1).—Attention was called in 1912 to the presence of a sweet potato disease in the Dismal Swamp region of Virginia, where as many as 95 per cent of the plants were affected.

The organism causing the disease attacks the stem, turning it black from a little below the soil line to from 3 to 5 in. above it. The first visible sign of the disease is a blackening of the lower part of the stem followed by a yellowing and dying of the lower leaves.

Successful inoculations were made with cultures of the fungus both in the greenhouse and on the Potomac Flats near Washington, D. C.

The disease was found to be due to a new species of *Plenodomus*, the name *P. destruens* being given it.

Experiments with *Rhizopus nigricans* on tomatoes, H. WORMALD (*Jour. Southeast. Agr. Col. Wye*, 1912, No. 21, pp. 381-391, pl. 1, figs. 2).—In connection with a study of the rot of tomatoes due to this fungus, the author carried on

inoculation and other experiments which showed that *R. nigricans* is a wound parasite which is capable of producing a rapid decomposition of the fleshy tissues of the tomato, even of green immature fruit. Neither the germ tubes nor the aerial hyphae were found capable of penetrating the skin of a sound tomato, but they gained entrance by way of cracks or punctures. The hyphae were much more virulent than the germ tubes produced from the spores. It was found that the development of the rot is favored by the presence of bruises, and that the fungus may also gain entrance through the removal of the stem from the fruit if the tomato is not quite ripe.

A comparison of the American brown rot fungus with *Sclerotinia fructigena* and *S. cinerea* of Europe, W. A. MATHENY (*Bot. Gaz.*, 56 (1913), No. 5, pp. 418-432, figs. 6).—Attention is called to the claim that *S. fructigena* attacks pome as well as stone fruits in America, while in Europe it is confined to pome fruits and the related species, *S. cinerea*, to stone fruit. As a contribution to our knowledge of these fungi, the author gives results of the study on some of the morphological characters of the two species and their behavior on different hosts. Pure cultures and mummified fruits containing both species were secured from Europe and the growth and other characteristics were compared with a locally produced brown rot fungus.

As a result of over 300 experiments, wide differences were noticed between *S. fructigena* of Europe and the local brown rot. *S. cinerea* when grown on plums, pears, apples, and quinces agreed in practically every instance with the disease produced by the local fungus. When grown in pure culture the European *S. fructigena* never agreed with the local form, various morphological differences between the two species being pointed out. The author states that the American brown rot of stone fruits is not identical with *S. fructigena* occurring in Europe on pome fruits, but agrees more nearly with *S. cinerea* and should be referred to that species.

A bibliography is appended.

Winter injuries to fruit trees, M. A. BLAKE and A. J. FARLEY (*New Jersey Stat. Rpt.* 1912, pp. 79-85).—The authors report the winter of 1911-12 as a very severe one on many kinds of fruit trees and attribute it to the fact that the early part of the winter was exceedingly mild, followed by unusually low temperatures in midwinter accompanied by dry, cold winds. This produced a number of kinds of injury which are classified as root injuries, twig and wood injuries, trunk splitting, bark splitting, collar injury, sun scald, and bud killing. The different forms of injury are described at considerable length and suggestions given for their prevention. These consist in better fertilization and cultivation of the trees so as to promote vigorous growth, also the use of cover crops to prevent freezing and thawing. Collar injury, it is said, may be prevented by mounding the earth about the trunks of trees before freezing weather.

A new disease of apple buds, E. S. SALMON and H. WORMALD (*Jour. Southeast. Agr. Col. Wye*, 1912, No. 21, pp. 392, 393, pls. 2, figs. 2).—For a number of years it has been observed that the flower buds of certain apple trees failed to develop and remained unopened throughout the flowering season. An examination of the diseased buds revealed the constant occurrence of a mycelium among the bud scales. In a few cases bacteria were observed in the gummy fluid, but the trouble is believed to be due to a species of *Fusarium* as yet undetermined.

The Cytospora disease of the cherry, H. WORMALD (*Jour. Southeast. Agr. Col. Wye*, 1912, No. 21, pp. 367-380, pls. 16, figs. 2).—The author reports the death in 1910 of a large number of young bearing cherry trees. In 1911 the disease was less serious, although considerable injury was reported.

The leaves of affected trees show a general yellowing and wilting, commencing at the tips of the shoots. The leaves begin to wither in May and the whole of the upper part of the tree is dead by October.

An examination showed the trouble to be due to *C. leucostoma*, the same fungus having previously been reported by Aderhold on the Continent as destroying cherry trees (E. S. R., 15, p. 270). Inoculation experiments were conducted to determine the parasitism of the fungus, and while this was not definitely established, the author thinks there is sufficient evidence to consider it the primary cause of the trouble.

It is said that spraying would be of little effect in controlling this disease, and the removal and burning of the affected parts is recommended.

Disease of peaches and almonds, G. ARNAUD (*Rev. Phytopath.*, 1 (1913), No. 2, pp. 24-27, figs. 2; *abs. in Riv. Patol. Veg.*, 6 (1913), No. 7, pp. 218, 219).—This is a discussion of peach-leaf curl due to *Eoasacus deformans*. Directions are given for treatment with Bordeaux mixture and with lime-sulphur wash, both of which are said to give very good results as contrasted with those obtained from the use of iron sulphate and potassium permanganate.

An epidemic of fasciation and coalescence in vineyards under forced culture, P. PÉCHOUTRE (*Rev. Vit.*, 39 (1913), Nos. 1005, pp. 404-407, figs. 2; 1010, pp. 587-592, figs. 8; 1011, pp. 624-629, figs. 8; 1012, pp. 659-664, figs. 6; 1014, pp. 724-729, figs. 9; 40 (1913), Nos. 1024, pp. 135-140; 1030, pp. 324-326).—As a result of studies by the author, illustrated descriptions are given of numerous anomalies of development as regards form, size, relation, etc., exhibited by shoots, leaves, tendrils, or fruits of several varieties of grapes as recently noted in the vineyards at Nanterre, near Paris. Prominent features are torsion, coalescence, or fasciation (in some cases very complex) of shoots; deformation, dwarfing, or coherence of fruits; absence of tendrils; and deformation or union of leaf blades, petioles, etc.

It is stated that the conditions in which these anomalies occur are usually such as to contradict the view that they are due to exaggerated nutrition and exuberant vigor. Among the causes of fasciation are thought to be mechanical and insect injuries. In general it does not appear that these anomalies are hereditary or that they are transmissible by segmentation.

References to the literature of the subject are included.

Factors in mildew attack, J. CAPUS (*Rev. Vit.*, 40 (1913), No. 1027, pp. 228-232).—Reviewing the results of recent study (E. S. R., 29, p. 849), the author suggests that an explanation of some apparent inconsistencies observed in connection with mildew attack may be found in the fact that the three main contributing factors to be reckoned with, namely, the presence and number of infecting bodies, favorable atmospheric conditions, and a susceptible state of the vegetative medium, are not necessarily coincident, constant, or subject to coincident or similar variations.

Studies on roncet, L. PAVARINO (*Riv. Patol. Veg.*, 6 (1913), Nos. 6, pp. 164-170; 7, pp. 193-203).—The author gives an account of his studies during 1912 and 1913, carried out with an organism obtained from grapevines of the variety *Rupestris* du Lot affected with roncet. This was grown in pure cultures, maintaining its specific characters for more than a year. It is said to be a very active polymorphic facultative aerobic bacillus, agreeing closely in morphological and cultural characters with *Bacillus baccarinii* studied by Macchiati (E. S. R., 9, p. 924; 10, p. 224) as found in association with "mal nero" or bacterial gummosis of grapes. Two other organisms isolated are also briefly noted.

A new schizomycete of grapevines, L. MONTEMARTINI (*Riv. Patol. Veg.*, 6 (1913), No. 6, pp. 171-176).—An injurious abnormality of grapevines is de-

scribed, said to be suggestive of *roncet* in some respects, but to lack some features of the latter. A schizomycete is found in constant association with the trouble.

Notes on *Cephaleuros*, N. THOMAS (*Ann. Bot. [London]*, 27 (1913), No. 108, pp. 781-792, pl. 1).—A report is given of a study of Ceylon and Barbados specimens of *Cephaleuros*, one of the species of which causes a very destructive disease of tea plants in India and elsewhere. The author's investigations of the forms studied indicate that they were free from infesting fungal hyphæ, which most previous investigators have described.

The importance and control of tumors on chrysanthemum and other plants, R. LAUBERT (*Möller's Deut. Gärt. Ztg.*, 28 (1913), No. 41, pp. 486-488, figs. 4).—Giving a brief account of some infection experiments with root tumors or crown gall of *Chrysanthemum frutescens*, the author recommends destruction or radical pruning of the plants affected, and discusses briefly various other measures intended to prevent the spread of the disease.

A disease of narcissus bulbs, G. MASSEE (*Roy. Bot. Gard. Kew, Bul. Misc. Inform.*, 1913, No. 8, pp. 307-309, pl. 1).—It is stated that a disease of narcissus bulbs, which was first noted as becoming troublesome about three years ago, has become serious, some growers losing a large proportion of their bulbs. A study of the trouble has shown that it is due to *Fusarium bulbigenum*. The disease is first indicated by the presence of small, yellowish spots on the leaves. Subsequently the mycelium passes downward into the bulb involving the fleshy bulb scales, and later causes them to rot. The disease is spread through slightly diseased bulbs containing the spores, or is introduced into sound bulbs through infected soils.

Wind as a pathological factor in regard to plants, F. J. MEYER (*Naturw. Wehnschr.*, 28 (1913), No. 38, pp. 599-606, figs. 5).—Illustrations and descriptions are given of some effects of wind in destroying, deforming, or stunting trees, or in affecting otherwise their normal development.

A bibliography is appended.

Polyporus dryadeus, a root parasite of the oak, W. H. LONG (*U. S. Dept. Agr., Jour. Agr. Research*, 1 (1913), No. 3, pp. 239-250, pls. 2; *Phytopathology*, 3 (1913), No. 6, pp. 285-287).—Attention is called to the rot attributed in Europe to *P. dryadeus*. The author states that a study of materials indicates that the fungus is undoubtedly identical with the heart-rotting fungus known in America as *P. dryophilus* and that the rot and sporophore described by Hartig do not belong to *P. dryadeus* but to *P. dryophilus*.

Extensive field studies made in the forests of Arkansas, eastern Texas, Oklahoma, Maryland, and Virginia showed that the fungus *P. dryadeus* is common on many species of oak, where it produces a white sap rot and a heart rot in the roots. The growth of the fungus seems to be limited to the underground parts of the tree. In most cases only old or much suppressed trees were found attacked by the fungus. The disease does not seem to spread to adjacent trees. It is believed to be widely distributed both in America and in Europe, probably being found in these countries throughout the range of the oak trees.

A short bibliography is appended.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

[Game and fur-bearing animals in Indiana], G. W. MILES (*Bien. Rpt. Comr. Fisheries and Game, Ind.*, 1911-12, pp. 229-267, pls. 15).—The papers here presented relate to attempts to establish European game birds in Indiana (pp. 234-236) with an illustrated account of H. A. Link (pp. 237-267) of The Fur Bearing Animals of an Indiana Farm.

Gaertner group bacilli in rats and mice, W. G. SAVAGE and W. J. READ (*Jour. Hyg. [Cambridge]*, 13 (1913), No. 3, pp. 343-352).—Forty-one rats were examined for the presence of Gaertner group bacilli. Bacilli identical with *Bacillus enteritidis* were isolated from 5 rats in each case from the spleen (in 2 from liver also), but no members of this group were isolated from the intestinal contents.

"Several of the rat sera were capable of agglutinating Gaertner group bacilli in high dilution. These facts point to the view that old infection with Gaertner group bacilli had taken place. The general result of the investigation is in favor of the view that while rats are liable to be infected with Gaertner group bacilli and to be ill in consequence these bacilli are not natural intestinal inhabitants. If this be accepted, it may be stated that this group of bacilli are not natural intestinal inhabitants of any known animal species.

"Rats infected with Gaertner group bacilli may serve as a means of infecting meat with these bacilli and may possibly in this way be a cause of meat poisoning outbreaks."

Report of the entomologist, T. J. HEADLEE (*New Jersey Stas. Rpt. 1912*, pp. 421-454, pls. 3, figs. 9).—This report consists of a number of articles by the author and others. An illustrated description of the new entomological building is given by R. S. Patterson (p. 422). A discussion of the occurrence of the more important insect pests during the year (pp. 423-443) and a preliminary report on greenhouse insecticides (pp. 444-450) are by H. B. Weiss. A brief report of work with the peach borer and plum curculio is given by R. S. Patterson (pp. 451-454).

In order to determine the value of various preparations sold as greenhouse insecticides, they were applied to palms infested chiefly by scales. *Kentia forsteriana*, *K. belmoreana*, *Latania rubra*, and *Pandanus pacificus* were all infested by *Chrysomphalus dictyospermi*, and *P. veitchii* by *C. aonidium*. The results are presented in tabular form. *Livistonia rotundifolia* and *Areca verschaffeltii* seemed to be the only plants which will stand Scalecide 1:20 without injury. "Scaline at 1:25 and 1:30 gives promise of being better than Scalecide, but further experimentation is necessary. Using hydrocyanic acid gas, the effects on the Kentias were discouraging. It failed to kill entirely when used at $\frac{1}{16}$ oz. to 100 cu. ft., and at $\frac{3}{32}$ oz. to 100 cu. ft. the plants were injured. However, *P. pacificus*, *L. rotundifolia*, and *P. veitchii* stood $\frac{1}{4}$ oz. to 100 cu. ft. with no injury and complete killing of the insects."

Insecticides experimented with to determine their value in destroying radish root maggots (*Phorbia fusciceps*), including corrosive sublimate, Sulfocide, and potassium cyanid gave negative results, as fully two-thirds of the radishes were infested and one-third were entirely unsalable.

Report of the entomologist, D. L. VAN DINE (*Porto Rico Sugar Producers' Sta. Bul. 5 [English Ed.]*, pp. 25-46).—This annual report of the entomological work for the year, which was mainly with May beetles and their white grubs, is in continuation of those previously noted (*E. S. R.*, 29, p. 52). The report includes a list of the species known to attack sugar cane in Porto Rico, together with their associates, parasites, and other natural enemies, and a list of the references to the entomology of sugar cane in Porto Rico.

A feature of the work of the year was the discovery of the occurrence of a weevil root borer of sugar cane in injurious numbers in several localities. Adults that were reared from grubs taken from the roots of cane have been identified as *Diaprepes spengleri*, which under the name *Exophthalmus spengleri* was recorded by Barrett in 1903 as an enemy of citrus stock and the following year as being abundant in orange orchards and common in coffee

plantations, and has since been reported by Hendricksen and by Tower as a pest in orange groves. The injury caused by this root borer is serious in restricted areas. The author observed the adult weevil feeding upon the leaves of sugar cane and in several instances upon the leaves of *Spondias lutea*, used as fence posts about sugar cane fields.

The larvæ of a rhinoceros beetle, the identity of which has not yet been determined but is thought to be *Strategus titanus*, recorded from St. Croix (E. S. R., 28, p. 256) and Jamaica, where it is a pest of sugar cane, and which was also recorded from Porto Rico by Stahl in 1882, have been found breeding at the roots of cane on the southern coast of the island and are a source of injury.

Several species of entomogenous fungi were found attacking some of the injurious sugar cane insects. The Hawaiian fungus *Metarrhizium anisopliæ* was found to attack both the adult May beetles and their white grubs, also the larvæ of the rhinoceros beetle. Observations indicate that this fungus was established on the island naturally previous to its intentional introduction from Hawaii.

Insects injurious to sugar cane in Porto Rico and their natural enemies, D. L. VAN DINE (*Jour. Bd. Agr. Brit. Guiana*, 6 (1913), No. 4, pp. 199-203).—A list of some 21 pests and their natural enemies.

Report on a trip to Demerara, Trinidad, and Barbados during the winter of 1913, G. N. WOLCOTT (*Porto Rico Sugar Producers' Sta. Bul.* 5 [English Ed.], pp. 47-68).—In reporting observations made during his trip the author first discusses cane cultivation on the several islands visited. This is followed by a detailed report upon sugar cane insects in each island, and their parasites and predators, and insect pests of cane growing in the islands whose introduction into Porto Rico should be prevented.

Report on a trip to Demerara, Trinidad, and Barbados during the winter of 1913, G. N. WOLCOTT (*Jour. Econ. Ent.*, 6 (1913), No. 6, pp. 443-457).—The data here presented are noted above.

Insect pests at St. Croix (*Agr. News [Barbados]*, 12 (1913), Nos. 302, p. 378; 303, p. 394).—This account from the report of the director of the department of agriculture at St. Croix for the year ended June 30, 1913, deals chiefly with the insect pests of sugar cane and cotton.

The most important pest of sugar cane is the rhinoceros beetle *Strategus titanus*. The pink mealy bug is of frequent occurrence and a source of considerable damage to sugar cane, especially to the young canes. The moth borer was also a serious sugar cane pest. The weevil borer (*Sphenophorus sericeus*) occurs in the cane fields each season; a large longicorn beetle (*Lagochirus araneiformis*) has been discovered boring in canes at the experiment station.

The cotton pests at St. Croix are said to be largely the same as those occurring in the adjoining islands of the Leeward group, namely, the cotton worm (*Alabama argillacea*); the cotton bollworm; several other lepidopterans, the caterpillars of which attack the flower buds and bolls, namely, *Prodenia ornithogalli*, *P. latifascia*, and two undetermined species; the green leaf bug (*Nezara viridula*); the leaf footed plant bug (*Phytoglossus gonandra*); the cotton stainer (*Dysdercus andreae*); and the leaf blister mite (*Eriophyes gossypii*).

The scarabee (*Cryptorhynchus batatae*) attacks potatoes in all parts of the island; Indian corn is seriously attacked by the corn ear worm and the so-called corn fly or leafhopper (*Dicranotropis maidis*).

New insect enemies of carnations in the vicinity of Antibes, E. MOLINAS (*Jour. Agr. Prat.*, n. ser., 25 (1913), Nos. 21, pp. 654-657, figs. 3; 23, pp. 717, 718, figs. 2; 26 (1913), No. 27, pp. 23, 24).—Three new pests, a microlepidopteran (*Tortrix pronubana*), a noctuid (*Brotolomia meticulosa*), and a hemipteran (*Aphrophora spumaria*) are said to have been the source of injury to carna-

tions. Accounts are given of the first two mentioned and means for combating them.

Rules and regulations of the South Carolina Crop Pest Commission governing the transportation of materials from cotton boll weevil territory (*South Carolina Sta. Circ. 16, pp. 3*).—The text of these rules and regulations is given.

Rules and regulations of the South Carolina Crop Pest Commission governing the transportation of cotton seed originating outside of boll weevil infested territory (*South Carolina Sta. Circ. 15, pp. 4*).—The text of these rules and regulations is given.

Notes on the negative geotropism of *Corythuca ciliata*, *Adalia bipunctata*, *Coccinella 9-notata*, and *Megilla fuscilabris*, II. B. WEISS (*Jour. Econ. Ent., 6 (1913), No. 5, pp. 407-409*).—The author concludes that "other factors being equal, sunlight and possibly high temperatures shorten the distance covered during a geotropic response and also the time during which the beetle responds to such stimuli, thereby giving the beetle a greater chance to find food. Sunlight does not, however, influence the direction of locomotion or the negative geotropic position assumed by the beetle."

A rhododendron borer (*Corthylus punctatissimus*), E. P. FELT (*Jour. Econ. Ent., 6 (1913), No. 5, p. 427*).—This ambrosia beetle was found working in rhododendron stems in New York City, where it seems to be a rather serious, though distinctly local, pest. It can be controlled by cutting out and burning the affected stems.

Notes on Oregon Coccinellidæ, H. E. EWING (*Jour. Econ. Ent., 6 (1913), No. 5, pp. 404-407*).—The author discusses the relative economic importance of different species of lady beetles found in Oregon, their migration and hibernation habits, and the emergence of adults in spring, and presents miscellaneous notes and observations.

The presence and percentage of cantharidin in *Epicauta adpersa*, J. SCHRÖDER (*Rev. Inst. Agron. Montevideo, 1913, No. 12, pp. 9-14*).—Analyses made of *E. adpersa* collected in Uruguay, by Siegfried's method, show the presence of 0.77 per cent of cantharidin in the fresh material and 1.72 per cent after drying at 45° C.

A brief review of our species of *Magdalis*, with notes and descriptions of other North American Rhynchophora, H. C. FALL (*Trans. Amer. Ent. Soc., 39 (1913), No. 1, pp. 23-72*).—This paper includes a synoptic table for the separation of 15 species of the genus *Magdalis*, of which 6 species are described as new. Biological notes relating particularly to their host plants are included.

Descriptions of and notes on weevils belonging to a number of other genera, namely, *Trichomagdalis* n. g., *Lixus*, *Dinocleus*, *Phyllotrox*, *Eulyptus*, *Anthonomus*, *Epimechus*, *Orchestes*, *Conotrachelus*, *Acallodes*, *Auletes*, *Baris*, and *Pycnobaris*, follows.

The present status of control measures for the rhinoceros beetle (*Oryctes rhinoceros*) in Samoa, K. FRIEDERICHs (*Tropenpflanzer, 17 (1913), Nos. 10, pp. 538-556, figs. 4; 11, pp. 603-619, figs. 9; 12, pp. 660-675, figs. 8*).—A discussion of the rhinoceros beetle, an account of which by Jepson has previously been noted (*E. S. R., 28, p. 561*). The subject is dealt with under the headings of direct and indirect measures, natural enemies being discussed under the latter.

An unusual type of injury due to a thrips, J. R. WATSON (*Jour. Econ. Ent., 6 (1913), No. 5, pp. 413, 414, pl. 1*).—The author reports observations of a new thrips (*Cryptothrips floridensis*), which is a camphor tree pest at Satsuma, Fla. The larvæ attack the buds, in some instances killing them outright. Later they attack the younger twigs—feeding in groups—causing the bark to dry up and crack.

"For the adults a solution composed of $\frac{1}{2}$ gal. whale oil soap, $\frac{1}{2}$ gal. of commercial lime-sulphur, and $\frac{1}{2}$ lb. of blackleaf 40 to 50 gal. of water is now in use. This has proved quite efficient."

Note on the occurrence of the felted beech coccus, *Cryptococcus fagi*, in Nova Scotia, C. G. HEWITT (*Canad. Ent.*, 46 (1914), No. 1, pp. 15, 16).—*C. fagi*, a coccid which seriously affects the beech in England and Europe, is said to be well distributed in the Halifax district, Nova Scotia, occurring on ornamental and forest beeches.

The gasoline torch treatment of date palm scales, R. H. FORBES (*Jour. Econ. Ent.*, 6 (1913), No. 5, pp. 415, 416).—The gasoline blast torch has been found to be very effective as it penetrates inward and downward into the spaces between the leaf bases, thus reaching and exterminating *Parlatoria blanchardi*, one of two important date scales occurring in Arizona. *Phenico-coccus marlatti* is not reached by this treatment, but by cutting the old leaf stubs of the palm clear down to the bole of the tree, thus largely removing the infestations of this scale, and then thoroughly burning the exposed bole of the tree with the gasoline torch it may be entirely removed.

Some recent studies of the grape phylloxera, P. MARCHAL and J. FEYTAUD (*Rev. Vit.*, 40 (1913), Nos. 1020, pp. 5-11, pl. 1, figs. 6; 1021, pp. 33-41, figs. 3; 1023, pp. 104-110, figs. 2).—A review of recent investigations of the biology of *Phylloxera vastatrix*.

The false tarnished plant bug as a pear pest, P. J. PARROTT and H. E. HODGKISS (*New York State Sta. Bul.* 368, pp. 363-384, pls. 8, figs. 11).—Recent investigations have shown that the injuries to pears, characterized by the cracking open of the skin in small spots and the formation of protruding granular areas, the seriously injured pears usually being deformed and undersized, are caused by *Lygus invitus*, which the authors have termed the false tarnished plant bug because of its resemblance to *L. pratensis*. The damage is done by the nymphs which attack both the fruit and foliage. They show a preference at first for the tender leaves, attacking those that are unrolled along the margins of the fold or those that are expanding at the apices or along the edges of the unfolded margins. The tissues about the points of injury turn black, and if the punctures are numerous, more or less extensive areas along the margins of a leaf shrivel and become dry. The dead portions later become detached from the healthy tissues by the whipping of the wind, which may cause the affected foliage, usually on the growing shoots, to assume a ragged or frayed appearance.

"The principal injury by this insect is the piercing of the young pears which later become much scarred and misshapen. The young nymph thrusts its proboscis deeply into the substance of the tiny pear and on withdrawing it sap flows from the puncture. The sap dries, leaving a blackish spot. One nymph may make many wounds, and the perforations, which at first seem small and inconsequential, result in a disfiguration which becomes increasingly conspicuous as the young pear develops in size. When the fruits have become as large as filberts they are conspicuously marked with hard, granular spots of irregular shapes, varying in size from a pin prick to $\frac{1}{4}$ in. Wherever they occur the epidermis is ruptured and uplifted while the exposed surfaces are mealy like and of a light yellow color, contrasting strongly with the healthy tissues. By cutting into the fruit one will find hard, flinty areas which form cores in the flesh. When these are numerous the knife cuts with difficulty through them. Similar injuries may occur on the stems. Occasionally a number of the diseased spots may coalesce, producing a large crack which extends deeply into the flesh of the pear. Severely injured fruit, besides being badly deformed, may also be stunted in its growth, which may seriously affect its market value."

The Bartlett pear is especially subject to attack; the Angouleme has frequently suffered to an equal degree, and the Clairgeau, Seckel, and Kieffer are susceptible to injury. Thus it would appear that none of the leading sorts are likely to be exempt from injury. The pest has been very destructive for many years in an orchard at Lockport, where in 1908 it was estimated that 75 per cent of the pears had been attacked, of which only 25 per cent would when mature prove saleable.

The work of this pest on the grape is less conspicuous than on the pear, its injury to the foliage being quite similar to that on pears and its attacks of the blossom clusters causing the most serious injury. Though it has not been observed to attack peaches under natural conditions it readily attacked them under confinement.

The authors present technical descriptions of its several stages, there being 5 nymphal instars. "The nymphs of the first two instars are pale, fragile creatures which are very active and subsist largely on the juices of the tender foliage. In the older stages they are more sedentary and attack both leaves and fruits. The habit of feeding in rather restricted areas is responsible for serious injuries to young pears. The destructive activities of the insects occur during the period coincidental with the conclusion of pollination and the formation of the fruit.

"Tests during the past 3 years have demonstrated that spraying as the blossoms drop largely prevents the deformation of the young pears. The spraying mixture that is recommended is $\frac{3}{4}$ pint of tobacco extract (400 per cent nicotin) to 100 gal. of water to which are added 3 lbs. of dissolved soap. Thorough applications, using liberal quantities of the spray, are essential to accomplish the desired purpose. . . . As injury occurs within a short period after fruit has set the orchardist should examine his trees carefully, commencing with the dropping of the petals, to note conditions with respect to the nymphs."

Brief mention is also made of *Lygidea mendax*, *Campylomma verbasci*, *Paracalocoris colon*, and *P. scrupeus* as associated insects.

A pear-deforming plant bug, F. H. HALL (*New York State Sta. Bul.* 368, popular ed., pp. 3-8, figs. 10).—A popular edition of the above.

A new insect pest of coconut palms in British Guiana, G. E. BODKIN (*Jour. Bd. Agr. Brit. Guiana*, 7 (1913), No. 2, pp. 87-90).—An account of *Castnia daedalus*, a lepidopteran which burrows between the trunk of the coconut palm and the broad and thickened bases of the branches. In old trees the signs of attack are said to be quite characteristic, consisting of deep, irregular, longitudinal scars or furrows running up the trunk of the palm in continuous lines. This borer is extremely abundant in British Guiana in coconut palms along the west bank of the Demerara River and the east bank of the Berbice River.

Control measures consist in the removal of all the lower branches by cutting away at the base and securing the worm. It is stated that as many as 19 specimens of *C. daedalus* in its several stages of development have been taken from a single palm.

A brood study of the codling moth, T. J. HEADLEE (*Jour. Econ. Ent.*, 6 (1913), No. 5, pp. 389-395, figs. 4).—This is a report of cage studies made in Kansas in 1912 of broods of the codling moth.

"In 1912 in the course of the outdoor tree cage studies at Manhattan, 3 distinct and successive appearances of each of the codling moth's stages, except of larval emergence, were determined. The third emergence of codling moth larvæ would come during late September and October. In view of the fact that larvæ emerging during late September and October in 1911 pupated and produced moths in the spring of 1912, it seems entirely likely that these larvæ

of the third brood matured, emerged, hibernated, pupated, and produced moths in the spring of 1913. The fact that only 48 per cent of the larvæ of the second brood pupated this season shows that the third brood is only partial."

The *Calliephialtes* parasite of the codling moth, R. A. CUSHMAN (*U. S. Dept. Agr., Jour. Agr. Research*, 1 (1913), No. 3, pp. 211-238, pl. 1, figs. 15).—This is a detailed report of studies of a species of *Calliephialtes*, the identity of which is still open to doubt, and in lieu of which technical descriptions of *C. messor*, characterized by Gravenhorst in 1821; *C. comstockii* described by Cresson in 1880; and *C. pusio* by Walsh in 1873, are reproduced. This parasite was imported into California in 1904 by G. Compere, who found it attacking the codling moth in Spain.

The author's studies, commenced in the spring of 1911, were conducted at Vienna, Va. He first describes the methods and apparatus used in its propagation. In a detailed account of biological studies much of the data are presented in elaborate tables. Oviposition began in cages about 9 days after the emergence of the female, the full-grown larva in its cocoon being the stage of the host selected. The eggs, only one of which is deposited at a time, are placed at almost any point in the cocoon, not necessarily on the host larva, and normally only one parasite develops on a single host. The results of cage experiments indicate that the total individual oviposition was in the neighborhood of 75 eggs, the average daily oviposition being about 2 eggs. The incubation period of 825 eggs varied from 1 to 7 days, or inversely with the average mean temperature. The larva begins feeding very shortly after hatching and may attack its host at almost any point, although it is more likely to attack the dorsum or sides than the venter. The feeding period, from the hatching of the egg to the beginning of the cocoon varied, in a total of 579 cases observed, from $3\frac{1}{2}$ to $18\frac{1}{2}$ days, with an average of about $7\frac{1}{4}$ days. A considerable portion of the larval life is passed in the cocoon, the maximum period in which, as determined for 116 female larvæ and 404 male larvæ, requiring 24 days and $36\frac{1}{2}$ days, respectively. The actual minimum and maximum larval periods for females were 12 and 27 days, respectively, and for males $7\frac{1}{2}$ and 51 days, respectively. The pupal periods, which were determined for 109 females and 366 males, varied from 6 days for males in July and August to 13 days for females in June. The period in the cocoon includes a part of the larval life, all of the pupal period, and a small portion of the adult life. The duration of this period was determined for 111 females and 396 males. The total possible minimum period is computed for females as 14.5 days and for males 10.5 days, and the total possible maximum period for females 39 days and for males 50 days. The actual minimum and maximum for females were 15.5 and 37.5 days, respectively, and for males 11.5 and 36 days. Transformation from the pupa to the adult within the cocoon takes place 1 or 2 days before the emergence of the adult, depending largely on the difficulty encountered by the insect in biting its way by the remains of the host and through the 2 cocoons. The average longevity of 132 females was 51 days. The females frequently fed on the juices of the codling moth larvæ, on one occasion a female having been observed to kill and partially eat a larva that had left its cocoon and was at large in the cage. The total developmental period from oviposition to emergence was determined for 112 females and 399 males, and for females it ranged from 23.5 days to 44.5 days and for males from 18 to 44 days.

No definite experiments were conducted in the experimental control of the development but Newman records having kept immature specimens of *C. messor* in cold storage for a period of 14 months, after which they emerged without having suffered in the least. As regards seasonal history the author reports that the first females emerged from hibernation in the spring of 1912 on May 3

and the last on May 15. The first egg was deposited on May 13, 10 days after the first emergence. From the earliest female progeny 3 complete generations were reared and from the latest group 2 generations, the total time consumed by the 3 generations being only 1 day longer than that consumed by the 2. With the hibernating brood this gives a maximum of 4 generations in the year and a minimum of 3 generations. Development was found to cease at about 50° F. although oviposition was frequently carried on actively at that temperature. This parasite hibernates as a full-grown larva in its cocoon, in which stage it is capable of withstanding a very low temperature. The mortality among hibernating larvæ during the winter of 1911-12 was very slight, if not nil, in spite of the fact that a temperature of -6° was recorded in the insectary.

In a study of the alternate hosts the author found that a *Enarmonia* larva available was parasitized within 2 days, a diminutive male emerging from the cocoon 22 days later. The larvæ of neither *Euzophora semifuneralis* nor *Gnorimoschema gallaesolidaginis* were parasitized, although the former were left in the cage for several weeks. A codling moth larva containing the internally parasitic larvæ of *Ascogaster carpocapsæ* was readily attacked and parasitized by this *Calliephialtes* and this always resulted in the death of the earlier parasite and the production of diminutive adult *Calliephialtes*.

An annotated list of 19 references to literature is appended.

On the pupal instar of the fruit tree leaf roller (*Archips argyrospila*). W. M. DAVIDSON (*Jour. Econ. Ent.*, 6 (1913), No. 5, pp. 396-398).—Records of the observations made at San Jose, Cal., in 1911 of the date of pupation and the date of adult emergence of 77 individuals of this pest are presented in tabular form.

Cellia pulcherrima, with some new facts as to the date of appearance and wintering of *Anopheles bifurcatus* in Turkestan, J. B. VASSILIEV (*Trudy Bûro Ent. [St. Petersb.]*, 10 (1913), No. 6, pp. 20, pl. 1, figs. 11; *abs. in Rev. Appl. Ent.*, 1 (1913), Ser. B, No. 11, pp. 193-196).—This paper includes biological studies of the anopheline mosquito *C. pulcherrima*, the most characteristic representative of the malaria-bearing species in Turkestan.

Report on the mosquito work for 1912, T. J. HEADLEE (*New Jersey Stat. Rpt. 1912*, pp. 457-506, pl. 1).—This consists of a brief history of the work by the author (pp. 457-461); reports upon salt marsh work (pp. 461-489) and upon the county mosquito extermination commissions (pp. 490-493), by H. H. Brehme; upon larvicides and calcium carbide (pp. 493-496), by H. B. Weiss; and upon mosquitoes of the season and miscellaneous inspections (pp. 497-506), by H. H. Brehme. The text of an act for the establishment of county mosquito extermination commissions is included.

The life history of *Dermatobia hominis*, F. KNAB (*Amer. Jour. Trop. Diseases and Prev. Med.*, 1 (1913), No. 6, pp. 464-468).—This is a critical discussion of recent papers relating to the manner in which the larva of this fly gains entrance to its host. It appears that the eggs of this fly are in some way attached in clusters of about 16 in number to the basal third of the abdomen of mosquitoes of the genus *Janthinosoma*. The eggs of the *Dermatobia* hatch and the larvæ find their way into the host while the mosquito is sucking blood.

The life history of the Mediterranean fruit fly (*Ceratitis capitata*) with a list of fruits attacked in the Hawaiian Islands, H. H. P. SEVERIN (*Jour. Econ. Ent.*, 6 (1913), No. 5, pp. 399-403, pls. 2).—This is supplementary to the papers previously noted (E. S. R., 29, pp. 54, 257).

Some parasites of *Simulium* larvæ and their possible economic value, E. H. STRICKLAND (*Canad. Ent.*, 45 (1913), No. 12, pp. 405-413, figs. 4).—In his discussion of this subject, accounts relating to which have been previously

noted (E. S. R., 29, p. 856), the author includes a brief résumé of the peculiarities in structure and habits of the larvæ. In the vicinity of Boston during 1911 the spring brood of *Simulium* was parasitized by various species of *Myxosporidia* up to as high as 80 per cent mortality, and by *Mermis* sp. up to 25 per cent mortality. The fall brood was parasitized by *Glugea* spp. up to 10 per cent mortality, and by *Gregarine* sp. up to 50 per cent mortality.

The rôle of ichneumon females in the control of the sex of their descendants, I. CHEWYREUV (*Compt. Rend. Soc. Biol. [Paris]*, 74 (1913), No. 12, pp. 695-699; *abs. in Jour. Roy. Micros. Soc. [London]*, 1913, No. 4, p. 385).—The author's observations of the oviposition of *Pimpla instigator* and other species in the pupæ of species of *Sphinx*, *Pieris*, etc., representing large and small pupæ, indicate that the female parasite adjusts the kind of egg to the nutritive conditions available. In the experiments conducted female parasites emerged from the large pupæ and males from the small pupæ.

The second paper (pp. 698, 699) relates to parthenogenesis. While the fecundated females lay eggs that develop into both sexes, those laid by virgin females produce males only. In the case of the fecundated females, the eggs which produce males are unfertilized eggs, and these are laid in smaller pupæ if any choice is afforded.

A fresh feature of the large larch sawfly outbreak in the Lake District, J. MANGAN (*Nature [London]*, 91 (1913), No. 2282, pp. 530, 531).—The author reports that during 1912 *Mesoleius tenthredinis*, which has frequently parasitized as high as 70 per cent of the larvæ of *Nematus erichsonii*, parasitized scarcely 2 per cent in the Lake District. On the other hand some 25 per cent of the cocoons yielded specimens of another ichneumon which has hitherto played quite an insignificant part as a parasite of this sawfly. The tachinid *Zenillia pexops* emerged from approximately 24 per cent of the cocoons.

A further parasite of the large larch sawfly, R. A. WARDLE (*Nature [London]*, 92 (1913), No. 2298, p. 320).—It is stated that the ichneumon parasite recorded above has been identified as *Hyperablus albopictus* (= *Mesoleius transfuga*).

The red spider on jute (*Tetranychus bioculatus*), C. S. MISRA (*Agr. Jour. India*, 8 (1913), No. 4, pp. 309-316, pl. 1).—Since 1909 when the attack of jute by this red spider was observed for the first time, it has been the source of considerable injury to this plant in India. "Besides jute, the red spider is also found on cotton, castor, mulberry, orange, indigo, *Trumpheta neglecta*, *Urena lobata*, *Hibiscus ficulneus*, *H. penduriformis*, and *H. abelmoscus*. In the case of castor, when the crop is badly infested the leaves turn pale yellow and become unfit to be served to eri worms (*Attacus ricini*)."

Its life cycle is said to be passed in 8 or 9 days. As a remedial measure, spraying with a mixture consisting of crude oil emulsion $\frac{1}{2}$ pint, flowers of sulphur 2 oz., and water 4 gal. is recommended.

New species of mite, H. E. HODGKISS (*Jour. Econ. Ent.*, 6 (1913), No. 5, pp. 420-424).—One species of Anthocoptes, 9 species of Eriophyes, 2 species of Oxypleurites, and 8 species of Phyllocoptes are described as new to science.

FOODS—HUMAN NUTRITION.

The phosphorus content of wheat and of wheat flour; and its relation to the baking qualities of the flour, H. L. WHITE and R. F. BEARD (*North Dakota Sta. Bul.* 106, pp. 59-64).—Hard wheat patent flours, hard wheat straight flours, and durum patent flours were used in these investigations, and determinations were made of the total, organic, inorganic, and water-soluble phosphorus.

According to the authors' summary, "a marked variation in all these divisions of the phosphorus content was found. A comparison of phosphorus content with loaf volume was made. Summarizing the data obtained, it is found in general that the larger loaves contain less of all divisions of phosphorus than the smaller loaves. Calculated on the basis of total phosphorus equal to 100 per cent, it is found that the larger loaves contain a higher percentage of organic phosphorus than the smaller loaves, the averages of two groups being 93.5 per cent for the larger and 87.3 per cent for the smaller."

The influence of bran extracts on the baking qualities of flour, H. L. WHITE (*North Dakota Sta. Bul. 106*, pp. 47-58, figs. 3; *Jour. Indus. and Engin. Chem.*, 5 (1913), No. 12, pp. 990-993, figs. 3).—Acid extract of bran, water extract, acid extract neutralized, and dilute hydrochloric acid were used to replace part of the water required for making dough in 2 series of baking tests with flour from Bluestem, durum, and Velvet Chaff wheat.

It was found, in general, that the acid extract produced loaves showing from 6 to 20 per cent increase in volume, with a better color and texture than were obtained in the check test or in the tests in which the other extracts were used. In the test with water extract, the loaves were somewhat larger in the check test, while with dilute acid a loaf of decreased volume and very poor texture was obtained.

Analysis of the acid and the water extract of bran showed 0.464 and 0.163 gm. P_2O_5 , respectively, per 100 cc. extract.

"It is thought the presence of both acid and soluble salts makes the gluten more coherent. In general, the better the flour, that is, the stronger the gluten, the more marked is the improvement by use of acid extract; but all samples of flour show greater or lesser improvement. The inner portions of the loaves of bread made with acid extract show no greater amount of water-soluble acid reacting material than the average of homemade or bakers' bread."

Experiments undertaken to show whether or not acid extract had a stimulating effect on yeast were not convincing.

The structure of the soy bean, T. E. WALLIS (*Pharm. Jour. [London]*, 4, ser., 37 (1913), No. 2597, pp. 120-123, figs. 7).—Histological data regarding the ground and the unground soy bean are reported. The author notes that soy bean meal is occasionally adulterated with cotton-seed meal, ground dried grains, sand, rice starch, and unidentified material.

Sections of the black and brown soy beans show "that the color is due to pigment in the cell walls of the epidermal cells. The walls are colored deep crimson in the case of the black beans and pale yellow-brown in the brown beans. The structure of all parts of the seeds otherwise exactly resembles that of the ordinary yellow beans."

Philippine fruits—their composition and characteristics, D. S. PRATT and J. I. DEL ROSARIO (*Philippine Jour. Sci., Sect. A*, 8 (1913), No. 1, pp. 59-80, pls. 16).—Data are given regarding the appearance, character, and uses of a large number of fruits, and analyses are reported. Among others, the list includes the mango, pineapple, pomelo, papaya, melon, tamarinds (ripe and green), mangosteen, guava, chico mamey, durian, and breadfruit.

A study of the composition of cider vinegars made by the generator process, L. M. TOLMAN and E. H. GOODNOW (*Jour. Indus. and Engin. Chem.*, 5 (1913), No. 11, pp. 928-933, figs. 3).—The conclusions drawn from the experimental data reported follow:

"Vinegar manufactured by the generator process is uniform in its composition, as uniform as the cider from which it is prepared—in which respect it differs materially from the vinegars manufactured by the old barrel process.

With the exception of the conversion of the alcohol into acetic acid there is but little change in the composition of the cider as it is being converted into vinegar. The most marked difference, other than the oxidation of the alcohol into acid, is the elimination, or perhaps, destruction of the fixed acids. Here there appears to be an almost constant loss during acetification. On the other hand, there is a considerable formation of pentosans in the generator. No appreciable loss in solids or nonsugars takes place, and the other constituents are practically unaffected. The amount of glycerol in the cider remains almost unchanged by its passage through the generator, and, as it is a product of the alcoholic fermentation, it is an important factor for the detection of adulteration in commercial vinegars. The percentage of ash in the nonsugar solids is remarkably constant, varying only within slight limits, and is of decided value as a standard for judging the purity of cider vinegars.

"The results indicate plainly that, given the composition of a hard cider to be used in this manufacture of vinegar by the generator process, it is possible to approximate very closely the composition of the vinegar which can be made from it."

The physiological significance of certain substances used in the preservation of food, J. H. LONG (*Trans. 15. Internat. Cong. Hyg. and Demogr. Washington, 2 (1912), Sect. 2, pp. 360-371*).—A résumé of work and discussion regarding the use and physiological effect on sodium benzoate, copper salts, and sulphurous acid in food materials.

The physiological significance of certain substances used for the preservation of foodstuffs, A. SCHATTENFROH (*Trans. 15. Internat. Cong. Hyg. and Demogr. Washington, 2 (1912), Sect. 2, pp. 371-380*).—A discussion of the effects of formic acid, boric acid, borax, sulphurous acid, salicylic acid, benzoic acid, hydrogen peroxid, formaldehyde, etc., on the physiological processes and their desirability as preservatives.

Cost and nutritive value of foods, C. F. LANGWORTHY (*Trans. 15. Internat. Cong. Hyg. and Demogr. Washington, 2 (1912), Sect. 2, pp. 550-573*).—A survey of the work done in the United States from 1907 to 1912 along the following lines: Studies of food and food products; special studies of ash, protein, and other food constituents; preparation, preservation, handling, and storage of food in relation to nutritive value; dietary studies and dietetics; digestion; metabolism experiments, including studies of income and outgo, made with respiration calorimeters; hygienic studies of foods in relation to their economic value; cost and economic value of food and other statistical data; and agencies for making information available.

A complete list of the publications referred to is appended.

Statistical data regarding the protection of food supplies in large cities in Germany, edited by H. SILBERGLEIT (*Statistische Beiträge zur Frage der Lebensmittelversorgung in deutschen Grossstädten. Berlin, 1912, p. 75*).—A summary of data, chiefly statistical, regarding slaughterhouse prices, sales, and other topics connected with the trade in meat, fish, and potatoes.

Retail prices, 1890 to August, 1913, F. C. CROXTON (*U. S. Dept. Labor, Bur. Labor Statis. Bul. 136, 1913, p. 146*).—In this publication, which is No. 11 of the Retail Prices and Cost of Living Series (E. S. R., 30, p. 259), statistical data are reported, chiefly in tabular form, regarding the prices of food, coal, and gas, and the scaling weight (i. e., weight of dough before baking) of the principal brands of wheat bread, the investigation covering a number of American cities.

The influence of preparation upon foodstuffs and their nutritive value, M. RUBNER (*Trans. 15. Internat. Cong. Hyg. and Demogr. Washington, 2 (1912),*

Sect. 2, pp. 591-602).—A survey of the common ways of preparing different classes of food materials for use and of the effect which the changes thereby produced have upon their digestibility.

Around-the-world cook book, MARY L. BARROLL (*New York, 1913, pp. VII+360*).—A collection of recipes, which, the author states, have been gathered from many sources in the United States and elsewhere.

Influence of quality and quantity of the food upon the growing organism, H. ARON (*Trans. 15. Internat. Cong. Hyg. and Demogr. Washington, 2 (1912), Sect. 2, pp. 451-456*).—A discussion, illustrated in part by the author's experiments with dogs, of the rôle played by the different food constituents in growth and of the beneficial effects of a generous diet.

Influence of chronic undernutrition upon metabolism, N. ZUNTZ, S. MORGULIS, and M. DIAKOW (*Biochem. Ztschr., 55 (1913), No. 3-4, pp. 341-354; noted in Biochem. Bul., 3 (1913), No. 9, pp. 72, 73*).—Respiration experiments were made periodically with a dog which was fed on constantly decreasing diets for a little more than a year, the weight and body temperature of the animal being noted daily during the entire time.

It was found that the energy utilized per square meter of body surface sank from 931 calories with an original weight of 10 kg. to a minimum of 631 calories with a weight of 4.98 kg. in the eleventh month and rose again to 921 calories with a weight of 4.10 kg. just before death in the thirteenth month. No typical differences were noted between the metabolism in this long continued undernutrition and that observed with fasting subjects. The natural expectation that the energy utilization would gradually tend to adapt itself to the insufficient food provided was not fulfilled. In fact, the contrary appeared toward the close of life.

The specific dynamic effect of foodstuffs, M. RUBNER (*Trans. 15. Internat. Cong. Hyg. and Demogr. Washington, 2 (1912), Sect. 2, pp. 383-389*).—A discussion of the author's theory that each food ingredient entails a characteristic increase in the energy transformed in the body.

The increase ascribed for the different ingredients is given as follows: Cane sugar, 5.8 per cent; fat, 12.7 per cent; and protein, 30.9 per cent. These values are termed by the author specific dynamic effect.

The work of digestion and specific dynamic action of foodstuffs, N. ZUNTZ (*Trans. 15. Internat. Cong. Hyg. and Demogr. Washington, 2 (1912), Sect. 2, pp. 390-394*).—A discussion of the problem of the increased metabolism following the ingestion of food from which the conclusion is drawn that the increase is chiefly due to the increased mechanical work of the digestive tract.

The influence of the ingestion of food upon metabolism, F. G. BENEDICT (*Trans. 15. Internat. Cong. Hyg. and Demogr. Washington, 2 (1912), Sect. 2, pp. 394-400*).—Basing his arguments upon the work of Müller and on original experiments (E. S. R., 27, p. 666), in which metabolism was measured after the ingestion of purgatives of nonabsorbable agar-agar as well as carbohydrates, etc., the author concludes that the increased metabolism after the ingestion of food is not due to mechanical activity in the digestive tract, but rather to the stimulus exerted on the general metabolism by the cleavage products of the food constituents.

The influence of foodstuffs and their cleavage products upon heat production, G. LUSK (*Trans. 15. Internat. Cong. Hyg. and Demogr. Washington, 2 (1912), Sect. 2, pp. 400-409*).—Respiration calorimeter experiments with dogs appear to the author to demonstrate "(1) that the increase in metabolism after protein ingestion is due to the stimulus of certain amino acids acting on protoplasm and (2) that the increase in metabolism after giving sugar and fats is

due to the increase of these metabolites in the blood stream." "There are the following forms of metabolism in the quiet or sleeping dog excluded from thermal influences: (1) A basal metabolism, in which the cells are nourished by a blood stream which does not receive food from the intestinal tract, but the composition of which is regulated by the organs of the body; (2) a metabolism due to plethora, induced by an increased quantity in the blood of carbohydrates or fat metabolites which are being absorbed from the intestine; and (3) a metabolism due to the stimulus of certain incoming amino acids acting upon the cells. The metabolism of plethora and the metabolism of amino acid stimulation can not be added to each other; there is no summation of effect when both influences are brought into action together. In other words, the rhythm of cellular motion induced by the presence of carbohydrates is not further intensified by the stimulus of amino acids, unless the latter alone would accomplish the result."

The rôle of proteins in growth, L. B. MENDEL (*Trans. 15. Internat. Cong. Hyg. and Demogr. Washington, 2 (1912), Sect. 2, pp. 429-438*).—A summary and discussion of the work done by Osborne and the author in feeding rats with isolated protein substances (E. S. R., 24, p. 304; 25, p. 864; 28, pp. 863, 864).

Studies of protein minimum, M. HINDHEDE (*Skand. Arch. Physiol., 30 (1913), No. 1-3, pp. 97-182, 228, figs. 5*).—This work is based on experiments similar to those previously reported (E. S. R., 28, p. 564) with subjects living on diets consisting mainly of potatoes and fat. The nitrogen content of the diets was very low, varying approximately from 3 to 8 gm. per day.

The author interprets the results as indicating that the protein minimum varies with individuals as it does with the same individual under different conditions of muscular activity. In these experiments, all excess of protein in the diet [*Luxusverbrauch*] is believed to have been absent, and the nitrogen excreted, therefore, represented only the inevitable loss of body cells. The results indicate that the utilization of protein during muscular work increases in the same ratio as, or one slightly greater than, that of energy.

The nutrition and growth of bone, F. H. MCCRUDDEN (*Trans. 15. Internat. Cong. Hyg. and Demogr. Washington, 2 (1912), Sect. 2, pp. 424-429*).—According to the author, bone, like other tissues, undergoes metabolism throughout life. When the new bone, which is constantly being formed, is not of proper composition, various diseases (rickets, etc.) may result. Bones serve as a storehouse of lime salts, according to the author, just as the liver serves as a storehouse of glycogen.

The antagonistic action of salts, J. LOEB (*Trans. 15. Internat. Cong. Hyg. and Demogr. Washington, 2 (1912), Sect. 2, pp. 457-463*).—In answering the question as to what is the physiological function of salts in the organism, the author emphasizes that of safeguarding the specific permeability of cells, a function which finds its expression in the so-called antagonistic salt action.

He carried on experiments with muscular tissue and eggs of the marine fish *Fundulus*, the results of which he summarizes as follows: "The antagonistic action of salts is due, in all cases where an analysis of these phenomena is possible, to a prevention of the increase in permeability which a salt would have if it were alone in solution. The fact that these injurious effects are reversible indicates that the changes in permeability may play a great rôle in the physiology and pathology of cells, a fact to which Osterhout has also called attention. The experiments show that the salts are responsible for the reversibility of the increase in permeability. It is also of importance that these experiments seem to prove that the antagonistic action of acids and salts, and possibly of electrolytes in general, is due to an action upon proteins."

The rôle of surface tension in determining the distribution of salts in living matter, A. B. MACALLUM (*Trans. 15. Internat. Cong. Hyg. and Demogr. Washington, 2 (1912), Sect. 2, pp. 463-474*).—The author summarizes the points made in this address, much of which is based on original microchemical investigations, by emphasizing "how far surface tension is a factor in determining the distribution and localization of salts in the fluids and tissues of the body. The forces governing the distribution of salts in ordinary solutions are profoundly modified in tissues and organs by the action of surface tension, which . . . is a very important factor in the processes of secretion and excretion. The part this force plays in determining the inorganic composition of the tissues and in influencing the functions of the organs" seems to him to justify that emphasis.

Lime requirements of man, H. KRUSPE (*Tonindus. Ztg., 37 (1913), No. 78, pp. 1024, 1025*).—According to the author's estimate, the amount of calcium oxid required per day is 1 gm.

The calcium oxid content of several foods is quoted. The author is of the opinion that the amounts of these eaten per day do not supply the necessary calcium oxid, so advises that calcium chlorid solution be added when bread is made, the amount being equivalent to 2 gm. calcium oxid per kilogram of flour.

The importance of nutritive salts in health and disease, R. PETERS (*Trans. 15. Internat. Cong. Hyg. and Demogr. Washington, 2 (1912), Sect. 2, pp. 628-639*).—A general discussion of the functions of the salts in food material in the light of some of the recent European observations and investigations.

The choice of foodstuffs in relation to disease, C. VON NOORDEN (*Trans. 15. Internat. Cong. Hyg. and Demogr. Washington, 2 (1912), Sect. 2, pp. 574-583*).—A discussion of dietetics with special reference to such pathological conditions as obesity, undernutrition, gout and the uric acid diathesis, diabetes mellitus, fever and Graves's disease, diseases of the stomach and intestines, and diseases of the kidney.

Diet as a weighty factor of causal therapeutics in severe diseases of the stomach and intestines, in troubles of metabolism, kidney troubles, disorders of the circulation, in pulmonary diseases, and in nervous and mental diseases, W. PLÖNIES (*Trans. 15. Internat. Cong. Hyg. and Demogr. Washington, 2 (1912), Sect. 2, pp. 483-535*).—A diet of starch, white of egg, and lean meat combined with complete rest is indicated for all diseases which have their primary cause in gastro-intestinal disorders and the consequent production of toxins or the impairment of the bactericidal function of the small intestine.

Diet in relation to disease, A. HOLST (*Trans. 15. Internat. Cong. Hyg. and Demogr. Washington, 2 (1912), Sect. 2, pp. 583-590, 619*).—This paper, much of which is based on data gathered in the author's laboratory, discusses the curative or preventive effect of different food materials on human and experimental scurvy, beri-beri, and polyneuritis gallinarum. It emphasizes the apparently opposite action of certain apparently similar food materials, citing, for example, the fact that scurvy on board ships in which dried potatoes were included in the diet has been cured when a supply of fresh potatoes has been obtained. Another example is that, although wheat bread always produces polyneuritis in pigeons, it appears much later when yeast is used instead of baking powder. Attention is also called to the fact that, whereas chickens fed on meat boiled for an hour at 100° C. do not develop polyneuritis, when they are fed on meat boiled for an hour at 120° they die of the disease and that they contract it with meat boiled half an hour at 110°.

To quote from the author's summary: "On the whole, our present knowledge of the diet in relation to beri-beri and scurvy shows that, in our daily food,

and, above all, in the vegetable nutriments, there are mysterious forces at work, the outlines of which are only just beginning to appear. . . . When fed on oats or barley only, guinea pigs constantly die from scurvy; but if we moisten the grains and make them sprout—that is, when we convert them into fresh vegetables—they prevent the disease.”

Relation of oysters to the transmission of infectious diseases, H. D. PEASE (*Trans. 15. Internat. Cong. Hyg. and Demogr. Washington, 4 (1912), Sect. 5, pp. 203–213*).—In this paper, what the author believes to be the best informed opinion regarding infection by shell fish is summarized as follows:

“Outbreaks of acute gastro-intestinal disturbances and of typhoid fever have been shown to be due to the consumption of raw oysters and clams which have been floated in specifically polluted waters during a nonhibernating season of the year for these shellfish, but . . . no evidence exists that oysters taken from their natural or final maturing beds during any season of the year, nor that any oysters—floated or not—during their hibernating period, have ever caused outbreaks or endemic conditions of any infectious disease. . . .

“The burden of official supervision, therefore, is determined by the life cycle of the oysters and the practical requirements for the conduct of the business. The important point is to determine the sanitary conditions of the drinking places during the late summer and early fall months. When this has been accomplished, it will doubtless be found that oysters taken from waters in at least the more northern sections of the Atlantic coast have ceased to be a factor in the transmission of infectious diseases.”

[Shellfish and transmission of disease], G. A. SOPER (*Trans. 15. Internat. Cong. Hyg. and Demogr. Washington, 4 (1912), Sect. 5, pp. 211–213*).—In an informal discussion of the paper noted above, emphasis is laid on the importance of controlling the use of hard or little-neck clams and also of soft clams from polluted waters.

“Unlike the oyster, which requires a rather firm, clean bed, the hard clam grows well in a muddy bottom. Sewage sludge itself is not unfavorable to it. It is not unusual to see persons digging hard clams close to the mouths of sewers. After a very short period in market this form of shellfish is often eaten raw. Hard clams are particularly in favor during those warm months when oysters are out of season and diarrheal diseases are most common. It would not be at all surprising if many outbreaks of diarrheal disease at seaside summer resorts were traceable to hard clams taken from nearby polluted sources. . . .

“What are known as soft clams in New York, but are simply termed clams in New England, are more often found in sewage polluted localities than are oysters or hard clams. They grow deeply buried in sand or mud, and are dug out of their resting places when the tide recedes and leaves their beds bare. Heavily polluted shores are among the most prolific sources of soft clams, and large quantities are annually taken from situations of this kind. . . .

“Unlike oysters and hard clams, which are now extensively planted and grown for market, soft clams are taken only in the wild state. . . . The persons who gather them usually consume them in their own homes, or distribute them among friends. To control the purity of soft clams will be more difficult than to prevent the pollution of oysters, but the beneficial results to be obtained would seem to make the effort well worth while.”

Some calorimetrical investigations relating to the manifestation and amount of imbibition heat in tissues, V. E. NIERSTRASZ (*K. Akad. Wetensch. Amsterdam, Versl. Wis en Natuurk. Afdcel., 20 (1911–12), pt. 2, pp. 1013–1024, fig. 1; Proc. Roy. Acad. Sci. Amsterdam, Sect. Sci., 14 (1912), pt. 2, pp. 1130–1138, fig. 1*).—The apparatus used in these experiments, called a bolometer by

the author, was a specially constructed differential calorimeter provided with sensitive electrical resistance thermometers.

Dried and powdered preparations of muscles and other tissues from cold-blooded (fresh-water mussel) and warm-blooded (rabbits and pigeons) animals were brought into contact with water in the calorimeter and the heat given off during the process of imbibition (real molecular swelling) was measured. It was found that all the materials tested were liable to imbibition, the process being attended by a considerable development of heat. Generally speaking, muscle tissue developed greater heat than kidney and liver.

Differences between tissues from different types of animals were less marked, though noticeable. The sensibility of the method is said to be very great, one division mark on the measuring wire representing an average of 0.001 or 0.002 gm.-calorie.

The work is of technical interest as suggesting new methods of research into the nature of some of the more obscure changes occurring in body tissue, and possibly into the action of digestive juices, etc.

Direct calorimetry of infants, with a comparison of the results obtained by this and other methods, J. HOWLAND (*Trans. 15. Internat. Cong. Hyg. and Demogr. Washington, 2 (1912), Sect. 2, pp. 438-451, fig. 1*).—A description of the methods used and the results obtained in respiration calorimeter experiments with infants under various conditions of nutrition.

ANIMAL PRODUCTION.

The element of uncertainty in the interpretation of feeding experiments, H. H. MITCHELL and H. S. GRINDLEY (*Illinois Sta. Bul. 165, pp. 463-579, pl. 1*).—In this bulletin the authors point out that many simple feeding experiments are of more or less ambiguous significance because of the dissimilarity which exists among the gains of individual animals, due to variable, uncontrolled, and largely unknown experimental conditions. Methods are proposed for "dealing with the question in a systematic and rational manner, so that the sphere of uncertainty surrounding the conclusions based on experimental results will be reduced to a minimum and be defined as clearly as possible."

It is first shown that all attempts to predict the result of repeating an experiment must be based on the "tendency of comparable experimental data to assume a definite frequency distribution, expressible by a frequency curve capable of mathematical definition." It is further explained that "an average is at best only an imperfect description of a series of experimental data, and when used for comparative purposes is often extremely misleading." The use of a factor, known as the standard deviation, is advised in comparing the gains exhibited by 2 different lots of animals and may be defined as "the square root of the average squared deviation of all individual gains from the average gain for the lot." On the basis of this standard deviation, the probable error to be encountered in predicting the result of repeating a feeding experiment may be determined. By the use of such a probability method it is possible to interpret the results of feeding experiments in a fairly satisfactory manner.

For extensive comparisons of variation "the coefficient of variation is used, this coefficient being simply the standard deviation calculated at a percentage of the average. The coefficient of variation of gains within lots is a good measure of the experimental error." From an extensive review of experiment station literature in this country it is found that the average coefficient of variation gains for similarly treated lots of sheep is about 21, for steers and swine about 17, and for poultry about 16 per cent.

Calculations indicate that experimental lots should contain at least 10 to 14 animals, or even 25 to 30 animals, when the rations or other conditions under

investigation are very similar. However, increasing the size of the lots is no remedy for a poor selection of experimental animals, nor can increased size of lots eliminate the element of individuality. The beneficial effect of increasing the size of lots varies not with the number in the lot, but with the square root of this number. Uniformity of gains within the lot is desirable and can be obtained by a reduction in the coefficient of variation of gains. The experimental error may be reduced by the selection of experimental animals homogeneous as regards age, breed, type, sex, and previous treatment. In this connection it has been found that as a rule lots exhibiting the best average gains also exhibit the more uniform gains, and vice versa; also that the changes in the variability of gains during an experiment may be materially reduced when conditions are constantly or increasingly favorable to growth and fattening.

Experimental evidence indicates that physiological selection of experimental animals does not eliminate the poor gainers, and that such selection is very inefficient in reducing experimental error, even when conducted along the most rigorous lines.

The difficulty which some stations have had in duplicating experiments and results leads to the conclusion that the frequent tendency to generalize from data of a very specific description should be carefully guarded against. It is further recommended that experimental rations be submitted to a chemical analysis, for "the practical utility of average analyses is limited, and in the case of many of the grains and roughages is small, indeed." On the other hand, the individual feeding of animals in ordinary feeding trials is deemed unnecessary and entirely out of harmony with ordinary practice.

In concluding this bulletin the authors present their views relative to the publication of results and the formulating of results, showing wherein caution and precision must be used when asserting that a given experiment indicates a superiority of one ration over another.

There are appended statistical data concerning the rate of growth of sheep, swine, steers, and poultry; formulas for determining the number of animals to include in an experimental lot; additional data on the change in variability of gains in weight as related to feed consumption; and a bibliography of 84 references.

The element of uncertainty in the interpretation of feeding experiments, H. H. MITCHELL and H. S. GRINDLEY (*Illinois Sta. Bul. 165, abs., pp. 2-8*).—This is a popular edition of the above bulletin.

An investigation of the feeding value of flax material as determined by chemical analysis, J. W. INCE (*North Dakota Sta. Bul. 106, pp. 10-29*).—This article includes a summary of data as to the feeding value of flax straw and flax plant by-products, with comments on the extensive use of these materials in commercial stock feeds. The average composition of flax materials, as shown by analyses of materials collected in North Dakota in 1912, is given in the following table:

Analyses of flax materials.

Kind of material.	Moisture.	Protein.	Ether extract	Nitrogen-free extract	Crude fiber.	Ash.
	<i>Per ct.</i>	<i>Per ct.</i>	<i>Per ct.</i>	<i>Per ct.</i>	<i>Per ct.</i>	<i>Per ct.</i>
Flax straw, brown.....	4.47	9.20	4.03	.....	.....	4.06
Flax straw, green.....	4.96	7.87	4.17	.....	.....	5.34
Flax screenings.....	5.29	18.10	8.97	.....	.....	7.18
Flax chaff.....	4.86	9.06	3.42	.....	.....	7.20
Flax bran.....	5.96	9.08	3.57	34.51	39.78	6.01
Green flax straw shives.....	4.69	8.00	1.93	29.36	51.85	4.17
Dew-rotted flax straw shives.....	4.30	3.44	1.20	29.08	59.30	2.59

From the results of a feeding experiment, previously noted (E. S. R., 29, p. 366), the opinions and experiences of several farmers as to the feeding value of flax products, and other data, it is concluded that the farmer is justified in feeding these products in moderation, with due precautions against poisoning. Additional feeding experiments, however, are regarded as desirable.

Grape foliage in animal feeding, J. GIRARD (*Jour. Soc. Cent. Agr. Haute-Garonne*, 23 (1913), No. 245, pp. 171-176).—Grape foliage is fed to cattle either dried or ensiled, and is found to be both palatable and nutritious. The silage is preferred. As a forage, the leaves retain their green color and possess a pleasant odor. The usual daily allowance is from 10 to 15 kg. (22 to 33 lbs.) per head together with a grain ration.

Investigations on the change in the nutritive value of feeds from ensiling and on the consequent loss of nutritive value, IV, A. ZAITSCHEK (*Landw. Vers. Stat.*, 78 (1912), No. 5-6, pp. 401-408).—This is a continuation of work previously noted (E. S. R., 25, p. 479; 26, p. 360), experiments in feeding swine being conducted to determine the comparative feeding value of fresh and ensiled beets.

It is noted that the nutritive value and digestibility are lowered as the result of ensiling. This loss was especially noticed with beets stored for the entire winter and removed in the spring. Beets removed from storage in February suffered less loss of sugar and other nutrients. The net available energy value of fresh beets is reported as 38.04 calories per kilogram, and for ensiled beets 33.73 calories.

Silo and silage catechism, R. H. MASON (*South Carolina Sta. Circ.* 12, pp. 3-16, figs. 6).—A general circular treating of the different types of silos, silo construction, silage crops, filling the silo, and feeding silage.

Fodder and method of making same, V. CHRISTENSEN (*U. S. Patent* 1,073,591, *Sept.* 23, 1913; *abs. in Jour. Soc. Chem. Indus.*, 32 (1913), No. 20, p. 987).—"The concentrated saccharin juice of the agave is mixed with nitrogenous and cellulose substances, and the mixture dried and ground to form a 'conservable complete fodder.'"

Comparative value of brewery residue mixed feeds for ruminants, W. VÖLTZ, W. DIETRICH, and A. DEUTSCHLAND (*Wchnschr. Brau.*, 30 (1913), No. 45, pp. 575-578).—In sheep-feeding trials mixed feeds of chopped straw and brewery residue, and turf meal, charcoal, and brewery residue were fed. The relative digestibility, starch value, and feeding value of these feeds were determined and their economy demonstrated. The starch value for the chopped straw mixture was estimated at 55.65 kg. per 100 kg. of dry matter and that of the turf meal mixture at 23.85 kg.

Peanut bran in Germany, R. P. SKINNER (*Daily Cons. and Trade Rpts.* [U. S.], 16 (1913), No. 270, pp. 890, 891).—An account is given of the use of peanut shells and the red hulls which envelop peanut kernels for stock feeding. The shells are high in cellulose content and low in nutritive value, but the material is mixed with other feeds of higher value and is frequently used in the composition of molasses feeds to give them body. Peanut bran made from the hulls is said to contain varying amounts of fat and is considered a serviceable secondary stock feed.

Commercial feeding stuffs, R. F. KOLB and B. B. ROSS (*Feed Stuff Bul. Ala. Dept. Agr.*, 1911-12, No. 54, pp. 64).—This bulletin includes a discussion of the nutritive value of feeding stuffs, the calculation of rations, and the dangers resulting from the feeding of spoiled feeds. Analyses are reported of middlings, shorts, bran, screenings, molasses feed, dried beet pulp, mixed feeds, and pro-

prietary stock feeds. The text of the Alabama commercial feeding stuffs law, together with the feed definitions as adopted in 1911 and 1912, is included.

Steer-feeding experiments, W. H. TOMHAVE and B. O. SEVERSON (*Pennsylvania Sta. Bul. 124, pp. 23-39, figs. 4*).—In these experiments 2 lots of 12 steers each, weighing approximately 900 lbs., were fed during 140 days as follows: The steers in lot 1 received all the corn silage they would consume during the first 2 months of the feeding period, together with 3 lbs. cotton-seed meal per 1,000 lbs. live weight daily. At the end of 56 days they were fed in addition to this combination all the ear corn they would consume, this being replaced by shelled corn the last 2 months of feeding. Lot 2 received as roughage 20 lbs. corn silage per day per head and all the mixed hay they would consume during the first 56 days, together with 3 lbs. cotton-seed meal per 1,000 lbs. live weight daily. During the remainder of the period they were fed shelled corn as in lot 1.

The average daily gain per head for lot 1 was 1.944 lbs., for lot 2, 1.803 lbs.; the respective costs per pound of gain were 8.31 and 9.46 cts.; the profit per steer, not including pork, \$14.10 and \$11.22; the price received from a bushel of corn after paying for other feeds \$1.47 and \$1.31. Hogs following lot 1 gained 611 lbs., in lot 2, 575 lbs., increasing the total returns per steer \$2.23.

It is concluded that the feeding of corn silage alone as a roughage is the more satisfactory of the 2 methods of feeding, this experiment bearing out results of previous tests. Because of the palatability of corn silage the advisability of limiting the amount of silage in the ration in order to insure the greatest gain in flesh during the finishing period was demonstrated.

Comparative experiments in fattening sheep of the middle valley of the Tiber and the cross-bred Merino-Rambouillet; with some observations on the organic changes, G. TASSINARI (*Staz. Sper. Agr. Ital., 46 (1913), No. 1, pp. 57-78*).—In these digestion experiments the cross-bred sheep gave somewhat better results, taking on more fat and assimilating a greater portion of the feed allowance.

The management of sheep on the farm, E. L. SHAW and L. L. HELLER (*U. S. Dept. Agr. Bul. 20, pp. 52, pls. 4, figs. 15*).—This is a popular treatise on the value of sheep on the farm; the selection of stock; the feed, care, and management of sheep; caring for lambs; tagging, dipping, castrating, and docking. Plans for construction of feed racks are given. Shearing and care of wool, slaughtering, and the care of meat are discussed.

[Report of] sheep and wool expert, **J. W. MATHEWS** (*Rpt. Dept. Agr. N. S. Wales, 1912, pp. 55-59*).—This report first emphasizes the importance of the future development of the Merino to New South Wales. It is shown that many of the flocks have attained their present standard of perfection only after life-long work on the part of the breeders, and that closer settlement must necessarily result in the breaking up of many of these old established flocks. In view of this fact it is urged that the government take measures for the preservation of the Merino, and that a great state station be established which will supply New South Wales, Australia, and ultimately the world, with the purest and finest types of Merino that the country can produce.

In cross-breeding experiments the heaviest body weights were obtained from the Dorset Horn-Merino, Lincoln-Merino, and Border Leicester-Merino crosses in the order named, the Down breeds proving unsatisfactory. The heaviest fleeces were obtained from the Lincoln-Merino, Border Leicester-Merino, and Leicester-Merino crosses. Data are given showing the aggregate value of each type of cross-bred sheep, live and dressed weights, and weights of fleece for both local and foreign trade.

Australasian wool clip (*Daily Cons. and Trade Rpts. [U. S.], 16 (1913), No. 264, p. 759*).—The Australasian wool clip production for the current 12 months

is estimated at 2,407,000 bales, an increase of 160,000 bales on the output in the 1912-13 season.

An experiment in pig feeding and fattening on sugar cake, C. MANICARDI (*Indus. Latt. e Zootec.*, 11 (1913), No. 6, pp. 86, 87; *abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases*, 4 (1913), No. 6, p. 933).—In experiments with 40 pigs it was found that those fed a special brand of sugar cake, described by Cugnini on page 375, presented superior fattening results and more economical returns than those fed farinaceous feeds.

Country hams and bacon, and market classifications of pork products, W. L. NELSON and L. D. HALL (*Missouri Bd. Agr. Mo. Bul.*, 11 (1913), No. 6, pp. 53, figs. 32).—This deals with the preparation of country hams and bacon, but more especially with the market classification of these products. Some of the material has been taken from Bulletin 147 of the Illinois Station, previously noted (*E. S. R.*, 24, p. 69).

The inheritance of coat color in the horse, A. R. WALTHER (*IV. Conf. Internat. Génétique Paris, Compt. Rend. et Raps.*, 1911, pp. 491-502, figs. 6).—The author's observations and investigations are summarized as follows:

"There are 2 principal colors found in horses' coats, viz. yellow and red. These 2 colors, generally combined with black points, are the components of the coat colors of the wild horse (*Equus przewalski sp. equiferus*). . . . Yellow and red are allelomorphic to each other. Two yellow horses give rise to yellow horses and, in lesser numbers, to red horses. . . . Yellow is therefore dominant to red. These principal colors may be modified by 4 kinds of supplementary markings: Black marks (melanism), white hairs (leucotrichia), marks of the piebald horses (tachment, leucodermia), white stockings (balzanes). The 3 first are always epistatic on the principal color, and on each other, in the order named. . . .

"Albinism is very rare. It is probably a recessive. There is no direct connection between albinism, leucodermia, and leucotrichia."

[German horse control brands], KLUTE (*Deut. Landw. Tierzucht*, 17 (1913), No. 43, pp. 512-516, figs. 31).—A description of the various control brands in use in the studbooks of the several Provinces of the German Empire.

Report of the poultry husbandman, H. R. LEWIS and A. L. CLARK (*New Jersey Stas. Rpt. 1912*, pp. 99-103, 124-156, pls. 19).—In a study of the 3 different types of brooders, outdoor individual, kerosene indoor, and gasoline, it is concluded that the latter is the more efficient for the average farm poultryman.

It is stated that sprouted oats is one of the cheapest and best sources of winter succulence for fowls. The best results were obtained in sprouting oats, when they were sprouted in a warm place (60 to 80° F.), light or darkness being immaterial; previously soaked for one day; placed in trays to a depth of not more than one inch; and water applied once a day, very little the first 2 days and more as the growth advances. The use of nitrogen showed no benefits. Oats proved more suitable than barley, wheat, or rye.

Rations are suggested for a dry mash, summer dry mash, scratching ration, and night ration. In a 9 months' test of the laying capacity of 328 hens of different breeds the following percentage egg yield was obtained: White Leghorns and Rhode Island Reds 40, White Plymouth Rocks 37, White Orpingtons 32, Buff Orpingtons 31, Black Langshans 27, Barred Plymouth Rocks and White Wyandottes 26, and Light Brahmas 17. In general, there was noted among all the heavy layers a long body in proportion to its depth, with the heavy development behind forming a wedge shape when viewed from the side, late molting, a faded shank, bright full eye, often faded in color and free from surplus face wrinkles. The poorer producers were noted for an early molt and general sleek appearance.

An account is given of the reading courses and educational work being conducted, together with a statistical review of the poultry industry in New Jersey.

The Philippine chicken, V. F. ALLAREY (*Philippine Agr. and Forester*, 2 (1912), No. 4-6, pp. 49-55).—A study was made of the physical characteristics and utility value of the native Philippine chickens. They were found to have no established and well-defined type, and no fixed color. Their shanks are not feathered. The skin is usually white, but sometimes yellow or black. The hens are fairly good sitters and mothers. Practically no attention has been given to breeding, except for the production of game cocks. The eggs are small, and the hens seldom lay more than 8 eggs in one laying period and often become broody after laying 5 or 6. It has been demonstrated that native hens will not produce profitably if confined to the yard. The weight of the native chicken is surprisingly small, and it is thought that because of this there is little chance of developing a meat breed by crossing the native chicken with the meat breeds of other lands.

Experiments performed in order to obtain fixed and lasting varieties of poultry, R. HOUWINK (*IV. Conf. Internat. Génétique Paris, Compt. Rend. et Raps.*, 1911, pp. 524-533, figs. 40).—As the result of observations made of the variations in the native breeds of Drent, Holland, especially as regards the form of comb, wattles, and toes, presumably due to the rigors of climate, experiments were made to determine the relative influence of these environmental agencies in establishing fixed and lasting variations. The conclusion reached by the author is as follows: "Natural selection produces fluctuating variations in races of hardy fowls. By continued breeding of these fluctuating varieties, produced by natural selection, new fixed races may be formed. In agreement with Darwin's theory, the formation of races may be explained not only by mutations but also by fluctuating variations produced by natural selection."

Hybrids of the Barbary duck with the farmyard duck: Their egg laying capacity and their eggs, A. CHAPPELLIER (*IV. Conf. Internat. Génétique Paris, Compt. Rend. et Raps.*, 1911, pp. 503-506).—The author's observations confirmed the work of Poll in 1906 to the effect that the hybrids between the Barbary duck and the farmyard duck differ considerably in the development of the ovary according to which species is used as the male parent. The use of a male Barbary duck resulted in nonlaying female hybrids which possess a rudimentary Fallopian tube and ovaries bearing no trace of ovules. The females of a reciprocal cross produce a large number of eggs, but the eggs are always sterile. The average weight of the eggs from the hybrid is about two-thirds that of the eggs of either of the parents.

The duck and egg business of Pateros, M. B. RAYMUNDO (*Philippine Agr. and Forester*, 2 (1912), No. 4-6, pp. 56-59).—An account of the duck industry of Pateros, a town situated 10 miles from Manila, and for generations known because of its proficiency in this industry. Interesting methods of incubation, care, and management are described.

Report of the biologist, J. NELSON (*New Jersey Stat. Rpt.* 1912, pp. 281-345, pls. 8).—In securing data on oyster propagation for 1912 (*E. S. R.*, 28, p. 774), observations were made on the climatic, tidal, water, and filtration conditions at the Barnegat, Mullica, and Scullville stations.

Relative to spawning observations it is stated that the best oyster fry came from those individual oysters that spawn as near as possible to the date of the spawning climax, and, that as a general thing, "in our northern waters oysters spawn at a definite date, which can be foretold sufficiently early to allow of planting suitable cultch to catch the spat under the best conditions."

A couple of weeks generally intervene between the act of spawning and the act of "setting" of the spat, and spatting occupies but a few hours.

In experiments in coating tiles with various preparations to determine the effect of spatting it was found that copper paint and glaze were the poorest surfaces, while ordinary paint, gelatin, and linseed oil made a good showing. The best surface was the unglazed natural surface of the tile. In oyster shells coated with plaster no advantage was evident over those uncoated, while in clam shells the spat preferred the plaster coated.

A brief discussion is included on the floating of oysters (E. S. R., 27, p. 762).

DAIRY FARMING—DAIRYING.

Report of the dairy husbandman, A. S. Cook (*New Jersey Stat. Rpt. 1912*, pp. 159-172, 193-202, pls. 4).—Two lots of 2 cows each were fed for 30-day periods by the reversal system (15 days intervening between periods) on the following rations: Lot 1, corn and cob meal, and lot 2, corn meal, in addition to the regular basal ration composed of alfalfa hay, silage, corn stover, and cotton-seed meal. It is estimated that lot 1 received a daily ration of 22.45 lbs. dry matter, 1.596 lbs. protein, and 13.216 energy therms; lot 2, 22.67 lbs. dry matter, 1.666 lbs. protein, and 13.734 energy therms. For the entire period there was an increase of 90.2 lbs. of milk and 2.76 lbs. of milk fat in the corn meal ration. The cost of feed was 16.7 per cent greater in the case of the corn meal ration, and the corn and cob meal ration gave \$2.62 more profit than the corn meal ration or an increase of 17.5 per cent.

In comparing the efficiency of the different types of milk pails in the production of milk with a low bacteria count, the results with the Sterillac type showed 4,210 bacteria per cubic centimeter, the covered pail 5,375, the Gurler pail 7,240, the Sanitary pail 14,431, and the open pail 54,630.

Records are given of the station dairy herd in which it was found that the average milk production was 7,308.5 lbs., containing 278 lbs. of fat. The average net returns per dollar expended for feed, when roughage was figured at the cost of production, and milk at 5 cts. per quart was \$2.83, and when figured at the market price \$1.98. The total cost per quart of milk in the former case was 3.1 cts., and in the latter, 3.89 cts. The value of home-grown feed upon economical production is emphasized.

The "Pannello Zuccherino" (sugar cake) in the feeding of dairy cows, A. CUGNINI (*Ann. Ist. Agr. [Milan]*, 10 (1910-11), pp. 25-40, pls. 2; *abs. in Internat. Inst. Agr. [Rome]*, *Bul. Bur. Agr. Intel. and Plant Diseases*, 3 (1912), No. 11, pp. 2482-2486).—A report of feeding trials with a sugar cake made up of grape pomace meal, mixed with dry residues from the distillation of cereals and molasses, and containing approximately 14.34 per cent protein, 4.10 per cent fat, and 35 per cent nitrogen-free extract. Dairy cattle relished the feed and did well upon it.

Influence of the extracts of organs on milk secretion, L. GIUSTI (*Rev. Zootéc.*, 5 (1913), No. 49, pp. 6-11).—The conclusions of the author are (1) that the extracts of organs which when injected into the body stimulate milk secretion are those of the hypophysis, corpus luteum, parotid, mammary glands, spleen, lymphatic glands, thyroids, thymus, fetus, and uterus; (2) that those which have no apparent effect are from the stomach, intestines, lungs, placenta, vagina, brain, heart, liver, kidneys, pancreas, suprarenal bodies, and testicles; (3) that the action is temporary and diminishes on reinjection; (4) that the results are noted when the organs are macerated or a decoction made from them; (5) that the extract of the organ possessing the greatest and most manifest action is that of the hypophysis; and (6) that the influence of the extract

of the hypophysis on lactic secretion is not alone on the quantity but also on the quality of milk, as denoted by an increased amount of fat.

[Relation between an increase of the average fat content of milk and the economy of production], N. HANSSON (*K. Landtbr. Akad. Handl. och Tidskr.*, 52 (1913), No. 5, pp. 289-369, figs. 12; *Meddel. Centralanst. Försöksv. Jordbruk-sområdet*, 1913, No. 78, pp. 85, figs. 12).—The author studied the possibilities of increasing the value of milk production by improving the fat content of the milk, and on the basis of results obtained in Swedish cow-testing associations ascertained the variations in the feed consumption per kilogram of milk fat in the case of milks of high and low fat contents and per kilogram of milk of different fat contents. The results thus reached are held to furnish an answer to the question as to whether it is economically advantageous to increase the average fat content of the milk by systematic breeding operations.

It is shown that the percentage of milk sugar and ash are practically constant in relation to the milk yield, while the albuminoids stand in a definite relation to the total solids, making up about 25 per cent of these. The milk fat of milk of low fat content is, therefore, accompanied by considerably more non-fatty solids than that of milk of high fat content; hence where the milk is used for butter production, or where it is paid for by the test, it is advantageous to increase the fat content of the milk so far as possible.

The amount of fat eaten per kilogram of milk fat (as measured by the "feed unit system") is decreased with an increasing fat content of the milk. An increase in the fat of the milk from 3 to 4 per cent, under otherwise similar conditions, means a saving of from 4 to $4\frac{1}{2}$ feed units in the amount of feed required per kilogram of milk fat. This saving is more marked in the case of milk low in fat than with rich milk, and is greatly reduced when the fat content reaches $4\frac{1}{2}$ to 5 per cent or more. The amount of feed eaten per kilogram of milk fat also depends on the milk yield obtained, since the returns for the feed eaten are lowest in case of poor yields. Rich milk requires a greater feed consumption than milk low in fat, and this greater consumption nearly corresponds to the increased solids content of the richer milk. Where all milk represents the same price, it pays best, therefore, to produce milk low in fat, while when payment is made according to fat content or nutritive value it is of advantage to produce milk high in fat or to increase the fat content of the milk so far as possible, since only about 30 per cent of the value of the fat secured by the increased fat content is required to pay for the resulting increase in the feed consumption.

The studies of the quality of the milk transmitted by breeding animals to their progeny show that it is possible to increase gradually the fat content of the milk by careful selection of individuals with an inbred faculty for producing milk of a fat content above that of the average for the family. The influence of male and female animals appears to be equal with regard to the fat content of the milk of the offspring, provided both represent a similar degree of constancy in their fat contents. Within the herd, however, the bull exercises the greatest influence through the larger number of his descendants. Variations always appear in the transmission of the fat content, for the reason that not only the special fat content of the sire and the dam and the faculty to transmit this fat content varies but there are also various plus and minus variants. The individual can thus have a fat content appreciably different from that of either parent, while the average for all progeny lies quite near to the average figure for the genotypic fat content of either parent. The aim of the herd improvement, when payment according to quality is decided upon, should be to reach not the highest possible percentage of fat in the milk, but the highest possible production of fat. The direct method of improvement in the average fat con-

tent of the milk consists in a rigorous selection of breeding animals, especially bulls, by which the ability of the bull to transmit a certain fat content is judged by the average fat content of his dam, granddams, and full sisters, by his sire's and grandsire's influence on their daughters, and when the bull is old, by his own influence on the average fat content of his progeny.

Many instances are given in the report of the beneficial hereditary influence of bulls and cows in Swedish dairy herds on the average fat content of the offspring.

Cost of milk production, F. RASMUSSEN (*New Hampshire Col. and Sta. Ext. Bul.* 2, 1913, pp. 20).—In reporting the results obtained in a year's work with one New Hampshire cow-testing association comprising 26 herds and 326 cows, the following facts are noted: The average yield was 6,463.6 lbs. of milk and 243.6 lbs. of milk fat; the average percentage of fat was 3.76; the average cost of feed was 2.4 cts. per quart; the returns per cow per year above feed cost were \$43.77; and the returns for each dollar's worth of feed consumed was \$1.59.

A classification of the cows in the order of amount of milk produced shows a decrease in profit with a decrease in production. The largest producers were on the average the most profitable. The estimated cost of keeping a cow per year is \$147.73, for which itemized statements are included. The production necessary for profit ranges from 6,000 to 8,000 lbs. of milk per cow.

Prices farmers received for market milk during 1912 (*Cream. and Milk Plant Mo.*, 2 (1913), No. 2, pp. 2, 3).—Inquiries conducted by the Dairy Division of this Department show that the average price paid for milk to farmers supplying 26 of the leading cities in the United States during the year 1912 was 3.565 cts. per quart, the lowest price paid being 2.904 cts. and the highest 4.437 cts. per quart. The highest average prices were paid during the months of October, November, December, January, and February, the lowest during May, June, July, and August. There is a large variation noted in the prices paid in the different cities.

The public value of different milks, C. E. NORTH (*Med. Rec.* [N. Y.], 84 (1913), No. 21, pp. 924-927).—This article discusses the relative value to the public of different grades of milk as determined by their cleanliness, safety, and price. Assuming that the maximum values of these 3 items are 25, 50, and 25, respectively, the several grades of pasteurized, certified, and raw milk are rated.

The milk supply of Karlsruhe, G. BERG (*Schr. Ver. Sozialpolit.*, 140 (1912), pt. 1, pp. VIII+168, pl. 1).—A complete description of the methods of feeding and management of dairy stock in vogue in Karlsruhe, with a statistical review of the milk production and consumption, market prices of milk, and sanitation regulations in operation in that city.

Dairying in western Norway, B. M. RASMUSEN (*Daily Cons. and Trade Rpts.* [U. S.], 16 (1913), No. 261, p. 697).—It is reported that though dairying is a leading industry in this district, it is backward as to scientific methods and machinery. There is a movement to reorganize the dairy industry along modern lines especially in the establishment of cooperative plants. However, poor transportation facilities and other factors render this plan difficult.

[Dairy inspection], W. D. SAUNDERS (*Quart. Rpt. Dairy and Food Comr. Va.*, 1913, June-Aug., pp. 36, 37, 56-60).—A brief report of dairy farm and creamery inspection in Virginia, and of examinations of proprietary stock and poultry feeds.

Proceedings of the Iowa State Dairy Association held at Waterloo, Iowa, October 10 to 14, inclusive, 1911 (*Iowa Yearbook Agr.*, 1911, pp. 347-388).—The addresses given before this association dealt with the power problem in the

creamery; the moisture content and the butter-fat standard; the good and bad points of the convention butter; improvements in butter manufacturing; ice-cream making and its relation to the creamery; daily testing of cream; and the North Iowa Dairy Improvement Association.

Dairy bacteriological practicum, J. F. HUSSMANN (*Molkereibakteriologisches Praktikum. Hanover, 1913, pp. XI+144, pls. 19*).—The contents of this book on milk bacteriology are as follows: Morphology and physiology of bacteria, technique of dairy bacteriology, a short description of the fission fungi of importance to the dairy industry, bacteriological control of the milk industry, methods of taking photomicrographs, etc. The book is illustrated with plates of the apparatus required for the different operations.

Review of agricultural microbiology, M. E. KAYSER (*Indus. Lait. [Paris], 38 (1913), Nos. 36, pp. 581-584; 37, pp. 596-598*).—In this article the author outlines the recent work in agricultural microbiology as applied to dairying. Studies on the bacteria of soured milk, cheese ripening, and milk cultures of various kinds are reviewed.

Annual report of the dairy instructor, A. CONLON (*Tasmania Agr. and Stock Dept. Rpt. 1912-13, pp. 20, 21*).—Reporting on the quality of Tasmanian export butter, the author states that Australian butter as a whole is deteriorating, and that energetic measures will be required to successfully compete with the high-grade margarin products that are being put on the British market.

Margarin v. butter (*Pastoral Rev., 23 (1913), No. 9, p. 921*).—In this article it is claimed that the neutral animal and vegetable fats used in margarin manufacture can be given a lactic acid flavor almost identical with that produced in butter. The margarin is produced in a room containing a number of vats filled with new milk, all of which are fermented by lactic acid bacteria. Further to improve the quality of this product, "a process of hardening liquid oils, such as cottonseed, soy beans, sunflower, etc., by means of hydrogen has been adopted, which completely removes all flavor and color, and at the same time solidifies the oil."

[Camembert cheese], C. GROUND (*Indus. Lait. [Paris], 38 (1913), Nos. 32, pp. 509, 510; 34, pp. 551-552*).—These are short articles treating on the manufacture and market value of Camembert cheese.

A practical method of preventing the unnecessary waste of condemned milk (*U. S. Dept. Agr. Press Notice, 1913, May 17, p. 1*).—With a view to denaturing condemned milk, thus rendering it unfit for human use but without destroying its value as a feed for stock, tests were made with a rennet solution. A 3 per cent water solution made from powdered rennet (strength 1:30,000) was used, and 40 cc. of this solution was added to 5-gal. cans of milk at temperatures of 50 and 65° F., with a resulting coagulation in approximately 1 hour.

The cost of material for this method of denaturing is estimated at 3½ cts. per 10 gal. of milk, when powdered rennet costs \$7 per pound.

Utilization of all of the constituents of milk, C. GROUND (*Rev. Gén. Chim., 16 (1913), No. 15, pp. 261-268*).—This discusses the probabilities of utilizing for various purposes the casein, lactose, and salts contained in milk. The methods for preparing casein from skim milk and sugar from milk serum are discussed in detail. From 1,000 kg. of milk about 30 kg. of casein containing 10 per cent of water can be obtained, and about 32 kg. of lactose and 8 kg. of molasses can be prepared from 1,000 kg. of milk serum. Other products considered are vinegar, milk beverages, and phosphates, especially calcium phosphate.

Industrial uses of casein, W. H. HUNT (*Daily Cons. and Trade Rpts. [U. S.], 16 (1913), No. 255, pp. 561-564*).—For industrial purposes casein is commonly extracted from skim milk by the use of a solution of concentrated sulphate of

magnesium. Recently it has been obtained by a process of electrolysis, which has the advantage of cheapness of production, increased yield, and greater purity.

The most important use of casein is in the manufacture of galalith (milk stone), which is used in imitation of ivory, tortoise shell, and celluloid. This product is prepared by molding and compressing the casein in the presence of formaldehyde. Numerous factories are found throughout France and Austria. In 1910 about 440,000 lbs. of casein were transformed into galatin at Surgère, Charente-Inférieure, where 35 dairies bring their milk to the casein factory. The residue, containing a large proportion of lactose, is returned to the dairies where it is used as a feed for pigs.

Casein is also put out in the form of vulcanized products, and is used in the clarification of wines.

VETERINARY MEDICINE.

Veterinary materia medica and therapeutics, K. WINSLOW (*New York, 1913, 7. ed., pp. 779*).—In this edition (E. S. R., 20, p. 1183), which has been revised and enlarged, the chapters on the physiological actions of ergot and digitalis have been entirely rewritten, and those on adrenalin and quinin have been changed in order to bring them up to date. Large additions have been made to the sections on the therapeutic actions of iodine, bismuth, magnesium sulphate, lysol, phenol, cocaine, sodium chlorid, arsenic, camphor, antiseptics, vaccines, and practical disinfection. Among the medicinal agents included for the first time in this book are glycerophosphates, picric acid, sodium cacodylate, chlore-tone, cresol, aspirin, novocain, thiosinamin, fibrolysin, yohimbin, and phenolphthalein. A complete section on poisons and antidotes has been added.

Handbook of pathogenic micro-organisms, edited by W. KOLLE and A. von WASSELMANN (*Handbuch der pathogenen Mikroorganismen. Jena, 1912, vol. 1, 2. enl. ed., pp. X+1057, pls. 3, figs. 154*).—The contents of this volume are as follows: Review of the Historical Evolution of the Study of Infection, Immunity, and Prophylaxis, by R. Abel (pp. 1-29); General Morphology and Biology of Pathogenic Micro-organisms, by E. Gotschlich (pp. 30-292); General Methods of Bacteriology, by E. Friedberger and H. Reiter (pp. 293-554); Nature of Infection, Mixed and Secondary Infection and Transference of Infectious Diseases by Inheritance, by A. von Wassermann and F. Keysser (pp. 555-631, 632-658, 659-684); Biochemistry of Antigens with Particular Reference to the Chemical Principles of the Specificity of Antigens, by E. P. Pick (pp. 685-863); Specificity of the Organisms causing Infection, and The Principles of Acquired Immunity (Active, General, Local, and Passive), by W. Kolle (pp. 869-904, 905-942); and Natural Immunity, by M. Hahn (pp. 943-1020). The first edition of this volume has been previously noted (E. S. R., 16, p. 601).

Protein split products in relation to immunity and disease, V. C., V. C., JR., and J. W. VAUGHAN (*Philadelphia and New York, 1913, pp. XII+17-476, figs. 34*).—This represents a detailed account of the investigations of the authors and their coworkers which began nearly 15 years ago.

In the introduction the theories relating to the physiological and pathological action of the protein split products are discussed under the following headings: (1) Bacteria are essentially particulate, specific proteins; (2) all true proteins contain a poisonous group; (3) the chemical nucleus does not become a poison until stripped in part at least of its secondary groups, and the intensity of its poisonous action is determined by the thoroughness with which the secondary groups have been removed; (4) when proteins are submitted to the action of disrupting agents there is the possibility of the chemical nucleus being

set free more or less completely, and to the extent that if it is detached it becomes a poison; (5) the pathogenicity of a bacterium is not determined by its capability of forming a poison, but (6) is dependent upon its ability to grow and multiply in the animal body; (7) any foreign protein which can grow and multiply in the body of a given animal may prove pathogenic to that animal; (8) the infectious diseases result from parenteral protein digestion; (9) natural immunity to any infection is due to inability of the infecting agent to grow in the animal body; (10) the immunity which is due to recovery from an infection is the result of the development in the body during the course of the infection of a specific ferment which immediately destroys the infection on renewed exposure; (11) immunity established by vaccination is similar to that induced by an attack of the disease; (12) protein sensitization and bacterial immunity, apparently antipodal, are in reality identical; (13) protein sensitization consists in developing in the animal body a specific proteolytic ferment which digests the same protein on reinjection; (14) when a foreign protein is introduced into the blood of an animal it soon leaves the circulating fluid and is distributed throughout the tissues; (15) vaccines are protein sensitizers; (16) toxin immunity and bacterial immunity are radically different; (17) the protein poison is not a toxin; (18) the protein poison is not specific; (19) the tolerance which may be secured by the protein poison is not specific; (20) the sensitization developed by a protein is specific, but is not due to the poisonous group in the protein; (21) different proteins find in the body certain predilection places in which they are most prone to accumulate; (22) the symptoms of a given disease are largely determined by the location of the foreign protein; (23) the poison elaborated in all the infectious diseases is the same; and (24) when a cell in the animal body is permeated by a foreign protein, the former strives to elaborate a ferment by which the latter is destroyed.

The remaining chapters deal with the growth of massive cultures of bacteria; the chemistry of bacterial cellular substances; the cleavage of proteins with dilute alkali in solution in absolute alcohol; action on animals; the production of active immunity with the split products of the colon bacillus; the split products of the tubercle bacillus and their effects on animals; the anthrax protein; the cellular substance of the pneumococcus; protein sensitization; parenteral digestion; protein fever; specific ferments of the cancer cell; and the phenomena of infection.

The carbohydrate metabolism and the internal secretion, P. HÖCKENDORF (*Der Kohlehydratstoffwechsel und die innere Sekretion. Berlin, 1912, pp. 126*).—This book deals with the interrelationships of the various internal secretions and discusses, on the basis of the newer findings, the part played by these secretions in the diseases of metabolism.

A further study of the distribution of prussic acid in the flax plant, J. W. INCE (*North Dakota Sta. Bul. 106, pp. 30-46*).—This is a report of further investigations (E. S. R., 28, p. 477) of the poisonous principle contained in the flax plant. Analyses of about 80 samples of flax straw, chaff, screenings, the entire flax plant, and young flax for the seasons of 1911 and 1912 are reported with notes upon the character of the samples, with special reference to the percentage of prussic acid present. Some experiences of other experiment station workers and farmers in regard to the toxic action of flax products are cited.

The author finds that all flax materials evidently contain some of the poison, which varies with the stage of maturity of the flax, the part of the plant, and the species of flax, and also with some external conditions, such as weathering.

“While this poison in flax substances may not always become liberated and active enough to be fatal to animals who eat it, nevertheless it is necessary for

farmers to remember the possibility of fatal results, and feed only small quantities of the material until they are certain it will not kill their stock."

Veterinary notes, T. W. CAVE (*Jour. Southeast. Agr. Col. Wye, 1912, No. 21, pp. 439-453*).—These notes relate to struck sheep experiments; parasitic pneumonia of sheep due to the red lungworm (*Strongylus rufescens*), a disease allied to "husk," which is caused by the lung threadworm (*Eustrongylus filaria*); parasites of the fourth stomach of cattle; tuberculosis in cattle and the new tuberculosis order; and the death of fowls from impaction of the crop, due to improper feeding.

The behavior of new serum and liver substances, and levulosuria in trypanosomiasis, **K. SCHERN** (*Berlin. Tierärztl. Wchnschr., 29 (1913), No. 40, pp. 710, 711*).—Continuing previous work,^a the author sought to determine whether the substances capable of reviving or extending the life of trypanosomes, such as exist in normal serum, were present in other parts of the normal animal organism. Very labile trypanosomes, taken at the third stage of the infection, were treated with organ pastes.

Liver and serum were found to have an elective position in this regard. These substances were found to be very stabile so far as boiling and drying were concerned, and they could be preserved for a long time in a refrigerator at a temperature of 37° C. The activities of this substance or substances are suppressed by putrefaction.

From the liver and serum a substance was prepared in which the reviving and life-extending principles were present in concentrated form, and which after a period of 4 years was still active. Although these principles are present in the serum and liver of diseased animals, they seem to diminish toward the end of the disease. They are absent in the sera of rats in the third stage of the disease. The fresh liver of a rat which died from trypanosomiasis contained the active principle only in a minimum quantity. The possible relation of this principle in other diseases, as glanders, tuberculosis, anthrax, typhoid, and cholera, is also discussed.

Some intraperitoneal injection tests with levulose showed that infected rats in the third stage of the disease will discharge the levulose with the urine. Animals in the first and second stages of the disease did not eliminate levulose.

Tuberculous contagion by dried particles, P. CHAUSSÉ (*Rec. Méd. Vét., 90 (1913), No. 15, pp. 497-511*).—This deals with the history of the subject and criticizes Cornet's theory. It discusses especially tuberculosis caused by inhalation.

About the intracutaneous use of avian tuberculin for diagnosing fowl tuberculosis, **L. VAN ES** (*Ztschr. Infektionskrank. u. Hyg. Haustiere, 14 (1913), No. 4-5, pp. 271-296, pl. 1, figs. 2*).—Tuberculosis was noted among the poultry of the North Dakota Experiment Station, and it was decided to study the intracutaneous test as to its value for diagnosing tuberculosis in birds. The tuberculin employed was prepared in the usual manner from the avian tubercle bacillus and was used in a concentration of 50 per cent. In a few cases 100 per cent crude tuberculin was used but as it apparently gave weak reactions, its use was discontinued. The points of application were the comb and one of the wattles, and the injections were given as superficially as possible in order to reach the Malpighian layer. A Pravaz syringe having a small-bore needle was employed for the injections, and the amount of tuberculin given varied from $\frac{1}{20}$ to $\frac{3}{20}$ cc. of 50 per cent tuberculin per fowl.

It is stated that the results can be noted within 24 to 72 hours, but usually 48 hours post-injection. The diagnostic feature consists in noting the swelling

^aArb. K. Gsndhtsamt., 38 (1911), No. 3, pp. 338-367.

at the point of injection, and just as in mammals the typical reaction is one of varying degrees of intensity. The reactions were never accompanied by hyperemic manifestations. The center of the reacting focus of the comb usually is of a pale yellow color and the secondary area is dirty red brown and sometimes greenish. The swelling of the comb is compact while that of the wattles is usually edematous. In the latter the color varies between a dirty pale yellow and a dirty green. The reaction occurs most frequently in the wattles and where comparison was possible a reaction on the comb only was noted in 4.25 per cent of the cases, on the wattles in only 21.25 and on both in 74.5 per cent.

In all there were about 320 birds examined, some of which received tuberculin only once and others twice. Some of the birds came from flocks which were apparently free of tuberculosis. Of all the birds examined 207 were submitted to autopsy, and 108 of these were found to be tuberculous. Among 75 which gave typical reactions, 73 showed lesions. The number of nonreacting birds was 79, and of these 8 showed lesions. The birds with doubtful or minor reactions were 53 in number, and 27 of these were found to have lesions.

These findings, according to the author, show that the intracutaneous application of avian tuberculin is an almost certain method of diagnosing this disease. The doubtful reactions which occur may limit the usefulness of the test somewhat, although it was ascertained that in such cases one-half of the birds so reacting were found to be tuberculous. This aspect of the problem will, however, be studied further, especially with reference to the kind of tuberculin preparation used. The intracutaneous test probably will have its greatest usefulness in detecting the presence of tuberculosis in a given flock or as a means for guarding against the introduction of tuberculous birds.

The eye test was used in 50 instances with negative results. Many of the birds which were submitted to this test gave a positive intracutaneous reaction.

Tuberculin in diagnosis and treatment, BANDELIER and ROEPKE, trans. by W. B. CHRISTOPHERSON (*New York, 1913, 2. ed., pp. XVI+307, pls. 9, figs. 5*).—This text-book on the specific diagnosis and therapy of tuberculosis is in its second English edition and translated from the seventh revised and enlarged German edition. It is divided into the following sections: Theories of tuberculin reaction and the curative factors of tuberculin action; the specific diagnosis and the specific treatment of tuberculosis (chiefly from the human medical standpoint); and a special section which takes up pulmonary tuberculosis and tuberculosis of the respiratory tract, digestive organs, urogenital organs, serous membranes, eye, ear, skin, glands, bones, and joints. It also contains 25 temperature charts, 2 colored lithographic plates, 5 illustrations, and a bibliography.

Bovine tuberculosis in man, R. S. WILLIAMS (*Reading Univ. Col. Rev., 5 (1913), No. 15, pp. 217-230*).—The work of Robert Koch in regard to the transmission of tuberculosis from animal to man is reviewed, and is followed by the opinions of O. Bang, Sims Woodhead, Park and Krumwiede, Fraser, and Delépine. The conclusion reached is that bovine tuberculosis can be conveyed to man.

[Circular letter of the Board of Agriculture and Fisheries of Great Britain as to tuberculosis], S. OLIVIER (*Jour. Bd. Agr. [London], 19 (1913), No. 12, pp. 1043-1046*).—This deals with the measures recommended for the eradication of the tuberculous cow. It aims at the destruction of every cow found to be suffering from tuberculosis of the udder or discharging tubercle bacilli with the milk, and all bovines which are suffering from tuberculosis with emaciation. When tuberculosis is not detected in the animal after slaughter, its owner is to be reimbursed for the full value of the animal plus 20 shillings. "Where tuberculosis is found the proportion of the value of the animal payable by way

of compensation to the owner is made to depend upon the extent of the disease which is present."

The combating of bovine tuberculosis on the basis of mutuality, MORREY (*Rev. Gén. Méd. Vét.*, 21 (1913), No. 247, pp. 365-395).—A discussion in regard to tuberculosis as it exists among dairy and other animals in the districts of Charolles, Autun, Châlons-sur-Saône, Louhans, and Mâcon. The author proposes to eradicate tuberculosis by a mutual process, which is to include the activities of both the society of owners of the cattle and the State. The tuberculin test is to be used with a system of marking the tuberculous animals, marks which resemble the Murphy button used in intestinal surgery being placed on the left ear of the animal. The cost of eradicating the disease on a mutual basis is discussed.

Tuberculosis in goats, M. SCHLEGEL (*Ztschr. Tiermed.*, 17 (1913), No. 8, pp. 347-349; *abs. in Berlin. Tierärztl. Wchnschr.*, 29 (1913), No. 39, pp. 695, 696).—A description of two cases.

In one case the right lung showed pale yellow cheesy-calcified nodules ranging in size from a pinhead to a bean. The left lung showed large gray foci which when cut through showed a whitish yellow, creamlike, smeary mass inclosed in a gray white capsule. The trachea was filled with a slimy purulent secretion in which tubercle bacilli could be easily detected. The enlarged bronchial and mediastinal lymph glands also contained tubercle bacilli.

The other case represented a high grade of generalized tuberculosis of the lungs, liver, and kidneys. This animal was 7 years old and very cachectic. The bovine type of bacillus was noted in this case.

A preliminary report on the investigations of bovine redwater (cystic hematuria) in Washington, J. W. KALKUS (*Washington Sta. Bul.* 112, pp. 27, pls. 10).—This report is based upon investigations commenced by the station in 1908. The results have been summarized by the author as follows: "Redwater is a specific disease of cattle and is quite common in the western part of Washington. It is characterized clinically by the constant or periodic discharge of bloody urine and by its chronic course; and pathologically by the characteristic vascular lesions which occur on the bladder mucosa. The cause of the disease is yet to be discovered.

"Blood of sick cows seems to be innocuous to healthy ones. The disease has been apparently transmitted from a sick to a healthy cow by inoculation of the latter with the bladder lesions of the former. Although some drugs seem to render temporary relief, treatment as a whole has been very unsatisfactory. Permanent recoveries from redwater are doubtful; a cow once affected with the disease nearly always eventually succumbs to it."

Studies on hog cholera.—*Spirochæta suis*, its significance as a pathogenic organism, W. E. KING and G. L. HOFFMANN (*Jour. Infect. Diseases*, 13 (1913), No. 3, pp. 463-498, pl. 1, figs. 44).—Continuing the work already noted (E. S. R., 29, p. 681) the authors now report that *S. suis* is found in the intestinal ulcers, crypts in the ceca, and in the external local lesions of animals suffering from hog cholera. The spirochete resembles in many respects *S. pallida*, *S. gallinarum*, and other forms, and appears to be capable of breaking up into granules. These granules, the authors believe, may play an important part in the life cycle and physiological functions of the spirochete, as suggested by the notes of Fontes on tuberculosis (E. S. R., 27, p. 285). They are present in the blood of cholera hogs, and in cultures of *S. suis*, and are capable of producing the disease in healthy hogs.

"In the blood of hogs suffering from cholera the presence of a relatively large spirochete in few numbers has been recognized. As this organism has not been found in the blood of normal hogs, it may represent *S. suis* in a tran-

sitional form. Its morphological variation from *S. suis*, as found in ulcers and local foci, may be due to the unfavorable action of blood as a medium or to its natural processes as a part of the life cycle of the species.

"*S. suis* is an obligatory anaerobic organism and usually requires several weeks' incubation for growth to take place on artificial culture medium. It may be transferred from generation to generation on artificial culture medium. Cultures containing the organism in the form of granules and spirochetes may be passed through bacteria-proof filters and the spirochetes removed, the few small granules which pass through being capable of producing hog cholera or resistance to the disease.

"*S. suis* is capable of producing typical hog cholera when injected into healthy hogs. This is true not alone of contaminated cultures made directly from the intestinal ulcers of cholera hogs; second and third generations on artificial culture media, containing the *S. suis*, as well as the Berkfeld filtrates of the same transfers, are capable of producing hog cholera and marked reactions, which confer more or less protection against the disease. The pathogenicity of these cultures does not appear to be due to the passage of an unknown 'invisible micro-organism' which is finally transmitted to healthy hogs by inoculation. Control experiments tend to show that the pathogenicity of the cultures of *S. suis* is due to the species itself in the form of spirochetes or granules.

"Finally, in those hogs which received the disease from cultures of *S. suis*, the organism is present in the intestinal lesions or local external lesions, as demonstrated by the dark field examination.

"As the above results have practically fulfilled Koch's laws, in so far as it is possible with an organism possessing the biological characteristics of spirochetes, [the authors believe] it may logically be concluded that *S. suis* is more nearly established as the specific cause of hog cholera than any other known organism."

Cultivating the virus of hog cholera, W. PFEILER and W. LENTZ (*Berlin. Tierärztl. Wchnschr.*, 29 (1913), No. 39, pp. 689-692).—The virus used in these experiments was obtained from the organs of infected hogs, and filtered in order to render it sterile so far as visible organisms were concerned. A loopful was then tested with regard to its infectivity and another loopful was sown on a nutrient medium. In most cases no hog cholera was produced before cultivation in the medium. After cultivation a loopful of the culture was transferred into another flask containing nutrient medium and at the same time a loopful or a fraction thereof was given subcutaneously to shoats. The cultures were transplanted in the manner described until a dilution corresponding to 1:200,000,000 loopfuls was obtained. In most cases hog cholera was produced with every dilution (after cultivation) and almost every form of the disease could be noted.

It was also possible to cause the disease with an organ filtrate of the animals infected with the cultivated virus, and in some instances infection was produced by simple cohabitation and by feeding a 1:100,000,000 dilution.

A note on kidney worm infestation of swine as shown post-mortem at the Manila matadero, R. W. NEWCOMB (*Philippine Agr. Rev. [English Ed.]*, 6 (1913), No. 8, pp. 399, 400).—An investigation was made by the author of the occurrence of *Stephanurus dentatus* in native hogs killed at the Manila matadero, which at the same time permitted the gathering of information regarding its distribution in the southern part of central Luzon. In all some 2,000 hogs were examined and nearly 50 per cent found to be infested.

"The parasites are most commonly found in the fatty tissue posterior to the kidneys, though they may be found in the hilum of the kidney or even in the

kidney tissue itself, and occasionally in the mesenteric fat, the psoas muscles, and the neck of the bladder. Tubular tracts are formed of hard connective tissue sometimes as large as a pencil, and having very thick walls. Often a sort of nest is formed, composed of many convolutions of a single tube or of several of the tracts combined. These nests are often 2 or 3 in. (50 or 76 mm.) in diameter. When found in the kidney tissue the parasites are usually very small. They cause destruction of portions of the kidney with a subsequent formation of scar tissue which upon contraction distorts the surface of the kidney to a marked degree, so that it is often possible to detect an infested kidney by its exterior appearance. . . . Adhesions of the intestines to adjacent organs or other parts of the intestines are rarely found and very rarely an acute peritonitis due to perforation of the intestines or kidney."

606 in the treatment of the pectoral form of equine influenza, C. HÉBRAY (*Rev. Gén. Méd. Vét.*, 22 (1913), No. 255-256, pp. 113-117).—The author reports upon a case of this disease in a 5-year-old horse which on the sixth day developed serious complications, including double pneumonia and laminitis. The intravenous injection at this time of 2 gm. of arsenobenzol in 30 gm. of physiologic serum resulted in a rapid and complete recovery. The author considers the use of arsenobenzol in this disease to be more economical than are other medications usually administered, especially if the use of the horse is considered.

Autoserotherapy in veterinary ophthalmology, PRUNEAU (*Rec. Méd. Vét.*, 90 (1913), No. 19, pp. 640, 641).—A description of a case of pseudomembranous conjunctivitis in a mare which was treated successfully by autoserotherapy. The method of treatment consisted of introducing an appropriately prepared serum (blood from a vein), into the conjunctival sack. The eyes were also washed with serum after anesthetizing with a 4 per cent cocaine solution.

Autoserotherapy for treating exudative pleurisy, U. MELLO (*Mod. Zoiatro, Parte Sci.*, 1913, No. 8, pp. 303-316).—A description of 5 cases in horses successfully treated by this method.

Bacillus typhi gallinarum alcalifaciens and the disease which it causes in fowls, W. PFEILER and A. REHSE (*Mitt. Kaiser Wilhelms Inst. Landw. Bromberg*, 5 (1913), No. 4, pp. 306-321; *abs. in Berlin. Tierärztl. Wehnschr.*, 29 (1913), No. 24, p. 439).—The authors report studies made during the course of two outbreaks of disease among fowls. In serological and cultural studies the bacilli isolated were found to resemble the typhoid bacillus (*B. typhosus*). The organism was extremely virulent for chickens but ducks, geese, and pigeons were resistant to its action.

The paper includes a review of the literature and a bibliography of 17 titles.

RURAL ENGINEERING.

Obtaining ground water supplies by pumping, A. A. MEYERS (*Arch. Suiker-indus. Nederland. Indië*, 21 (1913), No. 29, pp. 906-942, pls. 4).—Methods of obtaining ground water for irrigation are discussed, dealing first with the sinking of deep and shallow wells, well casings, filters, etc., and second with deep and shallow well pumping machinery and both steam and electrical pumping power.

Data on pumping plants in different localities show a wide range of efficiencies. Attention is called to different irrigation districts to which pumping power is supplied from central stations.

A number of drawings and illustrations of pumping machinery and well equipment accompany the article.

Conservation and distribution of water for irrigation (*New York* [1913], pp. 77, figs. 62).—Applications of pumping machinery for irrigation are illus-

trated and described, and considerable data are given to be used in pumping, measuring, and distributing irrigation water.

The rating of current meters, J. B. BROWN (*Engin. News*, 70 (1913), No. 15, pp. 712-714, figs. 4).—This article describes the process of rating current meters used by a water company selling irrigation water by current meter measurement (E. S. R., 28, p. 889). The rating station consists of a concrete lined flume 175 ft. long over which a car driven by a variable speed motor is operated. Ten observations are taken with each meter at speeds approximating $\frac{1}{2}$, 1, $1\frac{1}{2}$, and 3 ft. per second. The observations recorded are number of revolutions of the meter, distance traveled, and time in seconds for each run. Revolutions per second and the corresponding velocities in feet per second are computed and rigorously adjusted, and from these results a rating curve is plotted.

Sample observations, computations, and the resulting curve are given, with formulas for computing and adjusting results.

Summary and report on the first subsoil blasting demonstrations in Trinidad, 1913, H. VINCENT (*Proc. Agr. Soc. Trinidad and Tobago*, 13 (1913), No. 9, pp. 449-454).—Experiments were conducted in the blasting of water-logged subsoils covering 11 districts of Trinidad, 8 of which possessed an extremely tenacious clay subsoil. About 15 acres altogether were blasted and 10 cases of dynamite cartridges were used. The summary of data given in tabular form shows that the depth of charge varied from 1 ft. 6 in. to 4 ft. and the spacing of holes from 8 to 24 ft.

From the results of the experiments the advantages of blasting water-logged lands are summarized, including the improved aeration of the soil, the decreasing of surface wash, the better incorporation of the plant food in manures, an increased solvent action from rain water, and an improved porosity in stiff clays, with consequent greater root depth and drought resistance.

Object-lesson and experimental roads, and bridge construction, 1912-13 (U. S. Dept. Agr. Bul. 53, pp. 34).—This bulletin describes in detail the construction of object-lesson roads during the past fiscal year, including one each of bituminous-concrete, bituminous-macadam, gravel-macadam, brick-cinder, and sand-gumbo roads, 3 shell roads, 4 gravel roads, 7 macadam roads, 9 earth roads, and 14 sand-clay roads. The total area of object-lesson roads showed an increase from 79,203 sq. yds. in 1905 to 488,331 sq. yds. in 1913.

In addition reports are given of bridge work and inspection of object-lesson roads, a report of work on the Memphis to Bristol Highway, and a brief account of experimental work for the year, which is to be reported in detail later.

Concrete roads and pavements, E. S. HANSON (*Chicago*, 1913, pp. 227, figs. 29).—It is the purpose of this book not only to stimulate the construction of concrete roadways but also to furnish road makers specific data from the experience of others. The matter is presented under the following chapters: Concrete as a road material; the construction of concrete roadways; the roads of Wayne County, Michigan; cost of concrete roads in Illinois; other examples of concrete roads; some data on city pavements; reinforced concrete pavements; concrete in combination with other materials; patented concrete pavements; the theory and practice of joints; some tests of concrete as a roadway material; bridges and culverts; sidewalks, curbs, and gutters.

Specifications for concrete roads and pavements from various sources are appended.

Concrete pavement troubles (*Cement World*, 7 (1913), No. 7, pp. 46-48, figs. 3).—Data and photographs are given relating to the causes operative in numerous examples of failure observed in concrete roads and pavements, covering a wide range of local conditions. Failures are attributed chiefly to

unscientific design, lack of rolling, incorrect proportions, improper materials or their defective preparation, mixing or careless placing, improper finish of wearing surface, faulty joints, neglect of protection, inadequate curing, and inspection.

Tests of concrete and brick pavements (*Engin. Rec.*, 68 (1913), No. 17, pp. 457, 458, figs. 4).—Tests were made on concrete and brick pavements by means of a so-called "determinator" designed by the department of public works of Detroit. A test space 40 ft. square was divided as follows: In half of the space a 1:1½:3 gravel concrete pavement was laid, in one-fourth of the remaining space crushed granite concrete, and in the remaining space a brick pavement composed of two sections similar in all respects except that one had a 1:5 mortar cushion and the other an ordinary sand cushion.

The determinator consists essentially of a central vertical column or pivot around which revolves a horizontal shafting having heavy cast-iron wheels on each end 48 in. in diameter with rims 3 in. wide. The weight transmitted to the floor by each wheel is 1,650 lbs. To reproduce the wear due to rough shod horses each wheel is provided with 5 plungers on the ends of which are metal plates having 4 steel calks. As the wheels revolve, these plates strike the surface of the pavement a heavy blow, estimated in this test at 150 lbs.

After 19,315 revolutions of the machine the gravel concrete had worn badly and unevenly, as much as 1½ in. in places, while the granite concrete showed only little wear and that very even. The brick section laid on a mortar cushion was in excellent condition while that on the sand cushion was beginning to disintegrate.

The use of mechanical power in German agricultural work, II. K. SCHWAN-ECHE (*Fühling's Landw. Ztg.*, 62 (1913), Nos. 2, pp. 41-65; 3, pp. 95-108, figs. 3; 7, pp. 242-272; 8, pp. 286-306; 12, pp. 426-443).—This article deals at length with the comparative efficiencies and economies of the various forms of power used in German agricultural work. The investigations are grouped under 3 heads: (1) Small power up to 15 h. p. for belt work confined to the farm yard. (2) power for heavier field machinery and for transportation, and (3) electric power plants and central power plants.

For work confined to the farm yard and requiring up to 15 h. p. it is concluded that wind power, when available, may be profitably used in spite of the high initial cost of the plant. In case wind power is not available and where an all-purpose power from 8 to 15 h. p. is desired, the small portable steam engine is concluded to be the most practical and economical if the engine operator can be profitably employed at other work when the engine is not in use. For smaller belt work the internal combustion engine may be profitably employed and also the electric motor, providing the price for electric current does not exceed 15 pfennigs (3¼ cts) per horsepower hour. Steam power is concluded to be in general the most efficient and economical power for the heavy field work of plowing, threshing, etc., where several related operations are combined into one operation.

A comparison of motor trucks and horses for transportation purposes indicates that the former may be used with economy only in case special apparatus for loading and unloading is used and where the truck is used at least 70 or 80 days a year, carrying a full load on an average of not less than 30 km. (18.6 miles) daily. The use of motor trucks is concluded to be uneconomical for farms smaller than 375 to 500 acres.

The article further considers small private electric power plants and central power plants, giving information regarding the installation and operation of the former and data on the cost of power from both.

Internal combustion motors in agriculture, NEUMANN ET AL. (*Jahrb. Deut. Landw. Gesell.*, 28 (1913), No. 1, pp. 205-222, figs. 25).—This article deals with the use in agricultural belt work of several types of small internal combustion motors using gasoline, oil, and naphthalin as fuel.

Curves showing the comparative costs of power per horsepower hour from various sizes of internal combustion motors and corresponding sizes of electric motors indicate that electric power for small farm belt work is the cheaper only when used a small number of working hours per year, while the cost of internal combustion power decreases gradually as the number of working hours per year increases from 1,000 to 2,000. This condition exists up to 16 h. p. when the curves show that steam power is a little cheaper than internal combustion power at 2,000 working hours per year. The cost of these two is equal at about 1,400 hours per year.

Rural lighting and motor service near Noblesville, Ind. (*Elect. World*, 62 (1913), No. 15, pp. 749, 750, figs. 5).—This article calls attention to a rural electric transmission system in Indiana supplying electric light and power to 100 strictly farm customers from a central station in a neighboring town. The farm lines are operated at 2,200 volts, single phase service, and the company estimates that at least four customers must be served per mile to make the line commercially profitable. The rates for service are 10 cts. per kilowatt hour, subject to a 5 per cent discount, with a minimum quarterly rate of \$1.50. Each farmer furnishes his own equipment, including transformer and wiring, poles, etc. from the main line. He also pays for a proportional share of the main line which is repaid in service at the stated rates.

Test of a nominal 10 h. p. benzin locomotive, J. REZEK (*Mitt. Landw. Lehrkanz. K. K. Hochsch. Bodenkul. Wien*, 1 (1913), No. 3, pp. 407-409, pl. 1).—A portable 4-cycle single cylinder internal combustion motor having a 180 mm. (7 in.) bore and a 260 mm. (10 in.) stroke, rated at 10 h. p., was tested under variable load and speed conditions using benzin as fuel. The fuel consumption per horsepower hour was in general found to decrease and the mechanical efficiency was found to increase as the load increased up to the rated capacity. Mechanical efficiencies of from 52 to 82 per cent were obtained.

The economy of motor trucks with special reference to agricultural conditions, E. JAENICHEN (*Maschinen Ztg.*, 11 (1913), No. 17, pp. 201-209, figs. 8).—Numerous data from actual experience with the use of motor trucks and horses for agricultural transportation purposes demonstrate the superiority of the former in both efficiency and economy. The data in all cases extend over a year's work and include initial cost, depreciation, interest, and cost of operation. The high initial cost of the truck is offset by its overwhelming advantages of speed, convenience of concentrated power, high loading capacity, and indifference to weather conditions and fatigue. The initial cost and cost of keeping a number of horses of power equivalent to the average truck, it is stated, exceed the initial cost and cost of operation and maintenance of the truck.

The first "stock" motor plow in Africa, H. VON NATHUSIUS (*Pflanzer*, 9 (1913), No. 6, pp. 283-287, pls. 4).—Plowing tests were conducted in hard packed sandy loam with a "stock" motor plow on which only 3 of the 6 shares were used. The average speed was about 3.7 ft. per second, the average depth of furrow about 8.6 in., and the average width of furrow about 13 in. An average of about 7.5 acres was plowed in 10 hours. The total cost per acre of the work, including interest on the investment and depreciation, was about \$4.35. Cost figures from a year's work, using 3 and 4 shares, show a total average cost per

acre of about \$3.70. These results are deemed not at all discouraging when the price of fuel and the unfavorable conditions of soil and weather are considered.

The advantages stated for this motor plow are that it is not affected by weather or weeds and saves high-priced labor. It is stated, however, that considerable changes must be made in the apparatus before satisfactory results can be obtained in the seeding and cultivation of cotton soils.

A new steam plow dynamometer, J. REZEK (*Mitt. Landw. Lehrkanz. K. K. Hochsch. Bodenkul. Wien*, 1 (1913), No. 3, pp. 393-406, pl. 1).—A new dynamometer for measuring the tractive effort of steam tractors is described which consists essentially of an oil-filled cylinder connected to the plow or other load and a piston in the cylinder connected to the drawbar of the tractor. The resulting oil pressure in the cylinder is transmitted to a revolving drum above, which registers the distance traveled and the corresponding tractive effort.

Service tests of this dynamometer and comparisons with other types serve to show its accuracy in recording minute variations in the tractive effort. It has the disadvantage, however, that the oil is likely to leak out of the cylinder, and must be watched in this respect.

Stock watering devices in lowland pastures, J. HEISIG (*Ztschr. Moorkultur u. Torfverwert.*, 11 (1913), No. 3, pp. 87-93, figs. 3).—Cheap and serviceable methods of watering stock in lowland pastures are described, including structures for storing water from wells, brooks, and springs.

Silos, construction and service, M. L. KING (*St. Paul, Minn.*, 1913, pp. 100, figs. 31).—This book takes up the fundamentals of silage preservation, describes different types of wood and masonry silos, and explains the details and the construction of what are considered the more important types, under the following chapters: Early development, fundamentals of silage preservation, wood silos, masonry silos, planning the silo, erection of stave silos, monolithic concrete silos, the Iowa system of building block silos, safe strength of materials, and buying and contracting for silos.

A study of the hog house question, PROBST (*Illus. Landw. Ztg.*, 33 (1913), No. 59, pp. 539-541, figs. 6).—This article deals with the design of hog houses, emphasizing, in addition to cost, warmth, dryness, ventilation, and sunlight as the essential considerations.

Studies in poultry house construction, H. R. LEWIS and A. L. CLARK (*New Jersey Stas. Rpt.* 1912, pp. 104-124, pls. 10, figs. 7).—This article reports studies of 5 types of poultry houses erected at the station plant during the fall and winter of 1911-12, and gives data in regard to cost and environmental conditions as they existed during the winter, including studies of temperature and moisture conditions.

The results of these studies point to the following conclusions: "(1) A house with a large area of glass and no muslin has a high moisture content and low temperature, accompanied with rapid changes. (2) An extreme open front house furnishes ideal conditions, providing the birds are protected from rain, snow, and drafts. (3) A house, the front of which contains some muslin and glass, is a very efficient type. . . . (4) Hollow tile construction makes a very desirable house, but it is doubtful whether at the present prices of tile and mason labor the resulting increased cost warrants its use. (5) A roosting closet with double walls is desirable in shed roof laying houses. (6) The providing of ample means of properly ventilating shed roof, paper covered houses adds greatly in reducing temperature during spring and summer. (7) Tongued and grooved boards for the outside walls when covered with a layer of building paper are reasonable in cost and supply in a great measure the nonradiating qualities of a double wood wall."

As a result of this study, a new type of house was evolved called the New Jersey Multiple Unit Laying House, which is described in detail. Studies of this type are to be reported in a later bulletin.

Housing farm poultry, B. ADLER (*Utah Sta. Circ. 14*, pp. 15-32, figs. 9).—This circular discusses some of the essentials of a good poultry house for Utah conditions and offers detailed plans and bills of material for three houses in which an attempt has been made to include these essentials.

One room school buildings (*Penn. Bd. Ed. Prelim. Bul., 1913*, pp. 13, pls. 10).—This bulletin presents suggestive standard plans and limited specifications for the construction of one-room school buildings for rural and suburban districts. These plans and specifications are said to conform to the modern principles of lighting, heating, ventilation, and physical activity.

The necessity of plumbing inspection in rural districts, W. C. GROENIGER (*Mo. Bul. Ohio Bd. Health, 3* (1913), No. 10, pp. 900-906).—This article deals with rural sanitation, considering briefly the subjects of water supply and sewage disposal and making a few suggestions regarding the proper installation and testing of plumbing. Attention is called to the many sources of pollution of water supplies and the reader is particularly warned against locating the so-called water-tight cesspool in the immediate neighborhood of wells or springs.

Bacteriological tests of methods of cleaning, W. D. FROST and Miss V. A. ARMSTRONG (*Addresses and Proc. Nat. Ed. Assoc., 49* (1911), pp. 985-990).—Studies of the relative number of bacteria present when floors are cleaned by different methods are reported, the experimental method followed being described.

In connection with vacuum cleaners, the authors note that with permanently installed systems bacteria are taken out of the rooms entirely, and, if the discharge pipe is properly located, do not return to the rooms. With portable cleaners, however, which discharge into the room, the larger or smaller number of bacteria pass from the container into the room, the number depending upon the kind of construction of the container, "hence they may be an actual menace to health. It is possible to obtain abundant data to warrant health officers forbidding the use of these machines by traveling cleaners, since it must be very evident that if *Bacillus prodigiosus* can be carried from one room to another, *B. tuberculosis* could be carried from one house to another."

RURAL ECONOMICS.

Our rural life and farm problems, S. A. LINDSEY (*U. S. Senate, 63. Cong., 2. Sess., Doc. 334, 1913*, pp. 3-17).—The rural life problems as seen by the author are principally due to the increase in tenantry, high rate of interest to farmers, and wasteful methods of distributing farm crops. To overcome these obstacles he suggests cooperation among farmers, rural credit, better transportation facilities, and better rural homes and schools.

How can a young man become a farmer, T. F. HUNT (*Berkeley, Cal.: Univ. Cal. [1913]*, pp. 8).—The author considers that one of the factors in keeping young men from becoming farm owners is the difficulty in obtaining the necessary capital. He suggests that postal savings deposits be lent to him at 3 per cent and the debt be cancelled by a system of amortization.

The needs of North Carolina farmers with regard to credits, marketing, and cooperation (*Rpt. Com. Appointed by Gov. N. C. on Needs N. C. Farmers. 1913*, pp. 13).—The commission announces as the principal need of the North Carolina farmer a modification of the European system of credit adapted to American conditions, so that a worthy citizen can buy land, drain it, and stock it properly.

It is stated that because of the undeveloped marketing system in North Carolina there is imported annually \$50,000,000 worth of food and feed products which should be produced in the State. Proper standardization is needed in order to market profitably the farmer's products. The belief is expressed that the farmer must bring about these results through his own efforts, but under the guidance of the State.

Cooperation in Brazil (*Relat. Min. Agr. Indus., e Com., Brazil, 1911, No. 3, pp. 133-200*).—This article traces the cooperative movement in Brazil from its beginning in 1819 by the formation of a society of agriculture, commerce, and navigation to the present time. It describes in considerable detail the different forms of organization and their adaptation to special industries, such as sugar and coffee production, agricultural credit, etc.

Report on the working of the cooperative societies in the Punjab for the year ending July 31, 1913, A. LANGLEY (*Rpt. Work. Coop. Soc. Punjab, 1913, pp. 3+2+11, tables 14*).—This report shows the workings of the societies for the fiscal year 1913, calling attention to the rapid expansion of the movement among the agricultural classes and to the fact that the opposition of the money lender is gradually being overcome. Statistics are given showing membership, receipts and disbursements, etc., for the central, agricultural, and nonagricultural societies.

Early associations for promoting agriculture and improving the improver, T. H. MIDDLETON (*Rpt. Brit. Assoc. Adv. Sci., 1912, pp. 709-730*).—The author sketches the various agencies that have been effective in improving British agriculture from 1860 to date.

Agricultural accident insurance in the Netherlands, E. VAN DER FEEN-MÜLLER (*Mitt. Deut. Landw. Gesell., 28 (1913), No. 40, pp. 555-558*).—This article traces the causes leading up to accident insurance associations for agricultural workers, describes the organizations, and gives considerable information concerning the number insured and the cost.

[Dairy farm management], D. H. OTIS (*Hoard's Dairyman, 46 (1913), Nos. 3, p. 52; 12, pp. 319, 329, 330*).—The first of these articles gives in detail the investment and income from the various kinds of live stock on two farms of approximately the same size, and points out that one farm made a much better profit than the other because of a better understanding of market conditions and of advertising.

In the second article a review and discussion is given of the managerial methods of two dairy farms, substantially alike, but one of which realizes an income of \$4,232.20, the other \$851.66. The author ascribes the greater profits of the former to the returns from larger sales and the increased inventory of equipment and live stock, particularly dairy cattle. It is deemed noteworthy that although this farm has the lower total capitalization, it has considerably more investment in pure-bred stock and equipment.

Statistical study of wheat cultivation and trade, 1881-1910, J. F. UNSTEAD (*Geogr. Jour., 42 (1913), Nos. 2, pp. 165-181, figs. 2; 3, pp. 254-276*).—By a study of the area, production, and trade in wheat for practically all the countries of the world the author comes to the conclusion that there has been an increase of about 300,000,000 bu. for the period of 1891-1900 over that of 1881-1890, and one of 700,000,000 bu. for 1901-1910 over 1891-1900. This increase was due mostly to increased acreage, but to some extent to increased average yield per acre.

The study also leads to the conclusion that the acreage may be considerably extended and a higher return per acre may be expected.

The following table shows the average yields and per capita consumption as given by the author:

Average yields and per capita consumption of wheat for countries named.

Country.	Yield per acre.			Per capita consumption.		
	1881-1890.	1891-1900.	1901-1910.	1881-1890.	1891-1900.	1901-1910.
	<i>Bushels.</i>	<i>Bushels.</i>	<i>Bushels.</i>	<i>Bushels.</i>	<i>Bushels.</i>	<i>Bushels.</i>
Austria-Hungary.....	17	17	18	3.5	3.9	4.2
France.....	17	18	20	8.2	8.1	7.8
Germany.....	22	25	29	2.3	2.9	3.1
India.....	10	10	11	.7	.6	.7
Italy.....	^a 10	11	13	4.3	4.1	5.5
Russia.....	^a 8	^a 8	10	^a 1.5	1.7	2.4
United Kingdom.....	28	30	32	6.0	5.9	6.0
United States.....	12	13	14	4.5	4.6	5.6

^a Estimated.

The agricultural outlook (*U. S. Dept. Agr., Farmers' Bul. 563, pp. 36, fig. 1*).—Notes and tables are given showing estimates of crop yields per acre, prices of staple crops, prices of meat animals, and average and total yield of all crops combined by States, with comparisons. A decrease of about 13.1 per cent in crop yields per acre is estimated as compared with last year, or about 6.3 per cent as compared with the estimated average yields of the last 10 years.

Statistics of agriculture in Russia, P. VON BOETTICHER (*Ztschr. Agrarpolitik, 11 (1913), No. 12, pp. 414-421*).—A detailed statement is given as to the origin of the Central Statistical Committee and the contents of the various statistical reports relating to agriculture issued since 1881.

Agricultural workers in Denmark (*Statist. Aarbog Danmark, 18 (1913), pp. 26-29*).—Statistical tables are given showing for 1911 the number actively engaged (*soutiens*) for all occupations and for agriculture, and the number dependent upon the workers (*soutiens*), i. e., the nonworkers (*nourris*) and the domestic servants.

The number of farms in Denmark (*Statist. Aarbog Danmark, 18 (1913), p. 36*).—The number and area of farms by sizes for 1873, 1885, 1895, and 1905 are given in the form of a statistical table.

The uses of land in Denmark (*Statist. Aarbog Danmark, 18 (1913), pp. 42-52*).—By statistical tables are shown the areas for practically all the crops grown and the production of the principal crops for 1912. The number of the various kinds of live stock and poultry are shown for 1909 by geographical divisions and by sizes of farms. Additional statistics are given showing the average annual production of milk per cow and its fat content.

Agricultural statistics of British India (*Statist. Abs. Brit. India, 47 1903-1912, pp. 124-134*).—Statistical data are given showing the areas under the principal crops for 1902-3 to 1911-12 for British India as a whole, with supplementary data for 1911-12 for the individual administrations. Data are also given regarding cooperative credit societies and rainfall.

AGRICULTURAL EDUCATION.

The work of the rural school, J. D. EGGLESTON and R. W. BRUÈRE (*New York and London, 1913, pp. IX+287, pls. 12*).—This book deals with such subjects as buildings, grounds, sanitation, the centralization of high schools, transportation, plans of instruction, agriculture, amusements, etc. It considers the

school as not an isolated fact, but an essential phase in the upbuilding of the rural community. The importance of the new rural school as an expression of a new movement in rural life is emphasized.

Decree of July 15, 1913, reorganizing the higher council of agriculture in France (*Rev. Vit.*, 20 (1913), No. 1026, pp. 213-215).—The organization and functions of the higher council of agriculture are outlined.

Statistics of education in the Kingdom of Wurttemberg for 1912 (*Statist. Unterr. u. Erziehungsw. Kgr. Wurttemb.*, 1912, pp. 64).—Statistics are presented for the agricultural institutions in the Kingdom of Wurttemberg.

[Agricultural education under the direction of the chamber of agriculture] (*Jahresber. Landw. Kammer Rheinprov.* 1912, pp. 71-93).—This is the annual report of progress in agricultural education under the direction of the chamber of agriculture of the Rhine Province, including the work of scientific and educational institutions, agricultural winter schools, special courses, and itinerant agricultural instruction.

Agricultural winter schools of the chamber of agriculture (*Ztschr. Landw. Kammer Schlesien*, 17 (1913), No. 41, pp. 1512-1514).—The object, organization, and admission requirements of the agricultural winter schools under the direction of the chamber of agriculture of the Province of Silesia are outlined.

How may agricultural instruction be adapted to present needs, M. ARTHOLD (*Wiener Landw. Ztg.*, 63 (1913), No. 83, pp. 939-941).—The author outlines briefly the facilities for agricultural instruction in Lower Austria below the agricultural intermediate school at Mödling, including agricultural technical schools with 1 and 2-year theoretical-practical courses, agricultural winter schools, and housekeeping schools, and discusses the following suggested improvements: (1) That the course of study of these technical schools be revised by representatives of the different kinds of schools, (2) that uniform instruction be issued to teachers, (3) that all schools receive resident students and possess a farm, (4) that the attendance be limited to from 20 to 30 students, (5) that a minimum admission age of 15 years for the 1-year schools and 17 years for the winter schools be required, (6) that a number of stipends of about \$81 be awarded annually for the further training of agricultural technical instructors, and (7) that agricultural teachers who can show more than the required 2 years of practical experience be credited with half of such time when appointed in the state service.

Agricultural education and research (*Rpt. Scot. Agr. Com. Aust.*, 1910-11, pp. 153-172).—This report is not a detailed description of the Australian system, but records the impressions of the Scottish Agricultural Commission for 1910-11 concerning the efforts being made by the various Australian States to develop agricultural education and research.

The high school course in agriculture, J. MAIN (*Addresses and Proc. Nat. Ed. Assoc.*, 50 (1912), pp. 1393-1398).—This paper presents the report of a committee of the National Education Association in which is included a carefully worked out plan for determining the high school course in agriculture in accordance with the requirements of seasonal sequence in relation to the high school sciences. The committee has evidently kept in mind the psychological development of the child, the motive of agriculture in the high school and its correlation with the sciences, the motive of high-school science, the sequences of the sciences and agriculture, and other correlated subjects.

A discussion of the subject follows the report with some suggestions relating to courses of study in agriculture.

Agriculture in the rural schools.—Course of study, B. M. DAVIS (*Addresses and Proc. Nat. Ed. Assoc.*, 50 (1912), pp. 1398-1401).—This report points out

some of the guiding principles to be followed in outlining a course of study in agriculture in the rural schools, suggests units of instruction by groups and grades, and makes other suggestions as to the best methods of giving such instruction and correlating it with various agricultural activities found among patrons of the school.

A minimum course of study in agriculture for rural elementary one-teacher schools located in agricultural communities, R. O. JOHNSON (*Addresses and Proc. Nat. Ed. Assoc.*, 50 (1912), pp. 1401-1413).—This report outlines a course of study in agriculture for rural elementary schools located in agricultural communities, in which the committee has considered the need for a minimum course, what such a course should include, the weakness of the "rotation" course, the adaptation of topics to grades, and the adaptation of the course to schools with a varying number of grades. Suggestions are made as to what should be included in the minimum course and illustrations are given as to the manner in which topics may be worked out.

A schedule of the minimum course in agriculture as planned for the rural and graded schools of Iowa is also submitted, together with suggestive items for a course of home work to receive school credit.

Forestry and the public schools, E. R. JACKSON (*Addresses and Proc. Nat. Ed. Assoc.*, 50 (1912), pp. 1386-1391).—This paper discusses the relation of forestry to agriculture and the influence of forests upon soils, water supply, and the atmosphere of the continent; points out the educational value of the subject when properly taught; and claims that while it should not be introduced into the public schools by supplanting some existing subject it is an essential part of school work that may be used to supplement a number of other subjects.

Rural school gardens differentiated from city school gardens, V. E. KILPATRICK (*Addresses and Proc. Nat. Ed. Assoc.*, 50 (1912), pp. 1377-1379).—The author believes that both rural and city school gardens are justified on the ground that they offer a fundamentally educative material and furnish an interest which arouses the potent forces in the educative process used. The rural school garden aims to idealize agricultural work and improve agricultural methods, dignify farm life, and train the pupil for greater efficiency. The city school garden offers an opportunity for the pupil to work in the open air and sunlight, and while it does not teach him to become a farmer it trains him for citizenship.

The home garden and experimental plats, E. R. DOWNING (*Addresses and Proc. Nat. Ed. Assoc.*, 50 (1912), pp. 1381-1386).—In place of school gardens to be worked and looked after during the school session but allowed to grow up in weeds during vacation, the author advocates the establishment of home gardens and experimental plats in connection with the school, holding that their educational value is equal to that of the school garden and has added advantages in that it establishes normal relations of instruction between parent and child, adds to the economic resources of the family, and enables the school to avail itself of the skill and knowledge of the entire community in the garden instruction.

Suggestions are made as to how such a scheme could be enlarged by holding an agricultural fair at the school in the early fall, at which there should be a competitive exhibition of garden produce, flowers, vegetables, fruits, etc., that have been grown by the children alone or which they have helped to produce or prepare.

Farm crops laboratory material, A. C. ARNY (*Minnesota Sta. Press Bul.* 43, rev. and enl., 1913, pp. 16, figs. 3).—This publication gives a catalogue and price list of exhibits of a number of farm crops which have been prepared by the Minnesota College of Agriculture for sale with a view to overcoming the difficulty

experienced by schools and colleges in securing and keeping properly named specimens.

Elementary tropical agriculture, W. H. JOHNSON (*London, 1913, pp. XI+150, figs. 20*).—While this book is primarily intended for use in connection with the study of the principles of agriculture in schools, it is also considered of service to tropical planters. It is divided into 2 parts, viz, the soil and plant life and the school garden. Chapters consisting of discussions and demonstrations are devoted to the soil, seed, root, stem, leaves, flower, fruit, food of plants, plant diseases, insect pests, school garden, cultivation of various crops, and general cultural instructions.

Course of lessons in domestic science, MYRTLE L. WILSON (*Little Rock, Ark., 1913, pp. 128, figs. 6*).—The composition of food and other similar topics are taken up in connection with recipes.

Woman's congress [and exhibits of interest to housekeepers] (*Mich. Farmers' Insts., Inst. Bul. 19, 1913, pp. 225-275, 277-280, 284-287, figs. 191*).—Among the papers presented were the following: Planting the Home Grounds, by C. P. Halligan; How Can We Solve the Problems of the Farm Home, by Ilena M. Bailey; A Discussion on How to Solve the Problems in the Farm Home, by Mrs. F. D. Saunders; The Roasting of Meats, by Agnes Hunt; Using Sale Patterns, by Ora G. Yenawine; and Cooperation among Women, by Jennie Buell (including data on cooperative laundries).

Domestic science bacteriology formed a part of the bacteriological exhibit, and H. H. Musselman had arranged a household power plant exhibit. Both of these are described in considerable detail.

The organization of boys' and girls' poultry clubs, H. M. LAMON (*U. S. Dept. Agr., Farmers' Bul. 562, pp. 12, figs. 6*).—In addition to a suggested constitution and by-laws and information concerning the management of poultry, this circular gives a brief outline of 4 years' work for poultry clubs.

Boys' pig clubs, W. F. WARD (*U. S. Dept. Agr., Farmers' Bul. 566, pp. 16, figs. 8*).—This deals with such subjects as the objects of the work of pig clubs, the organization of boys' pig clubs, and general observations on pig management. A sample constitution and by-laws is appended.

The 1913 corn campaign ([*Philippine*] *Bur. Ed. Circ. 80, 1913, pp. 24*).—An account is given of the organization, supervision, finances, and plan of the Filipino boys' corn-growing contest conducted by the Bureau of Education, as a regular part of the industrial work of the public schools of the Philippines.

MISCELLANEOUS.

Annual Report of New Jersey Stations, 1912 (*New Jersey Stas. Rpt. 1912, pp. XXIV+527, pls. 93, figs. 23*).—This contains the organization list of the stations, a financial statement for the State Station for the fiscal year ended October 31, 1912, and for the College Station for the fiscal year ended June 30, 1912, a report by the director, and departmental reports, the experimental features of which are for the most part abstracted elsewhere in this issue. Reports have been previously noted on the inspection of fertilizers (*E. S. R.*, 28, p. 726) and feeding stuffs (*E. S. R.*, 27, p. 774), as well as the text of the laws relating to fertilizers, insecticides, and feeding stuffs (*E. S. R.*, 28, pp. 326, 352, 364).

Third Annual Report of Porto Rico Sugar Producers' Station, 1913 (*Porto Rico Sugar Producers' Sta. Bul. 5 (English Ed.), pp. 68*).—This contains the organization list and reports of the director, pathologist, entomologist, and assistant entomologist, the experimental work recorded being for the most part abstracted elsewhere in this issue.

NOTES.

California University and Station.—The university is cooperating with the Drainage Investigations of this Office in a study of the reclamation of alkali lands by drainage ditches and a pumping system. The 5,400-acre ranch at Kearney Park is to be utilized for this work, of which Walter Wallace Weir has been placed in charge.

The ministers' week, held at Davis December 1-5, 1913, was attended by 485 clergymen.

The class in building construction at Davis is to erect a new farm mechanics building.

Kentucky University and Station.—Ralph Kenney, assistant in farm crops in the college of agriculture, resigned January 1 to accept a position in the Kansas College and Station as assistant agronomist in forage crop work, and was succeeded January 20 by Dillon S. Myer. James E. Mastin, assistant chemist in the food and drugs department of the station, also resigned January 1 to become assistant in chemistry in the Mississippi College.

Massachusetts College and Station.—The extension service of the college has recently established a section of agricultural cooperation and marketing. Assistance is to be given in the organization of cooperative buying and selling associations, rural credit, the finding of a better market for agricultural produce, and other lines of agricultural cooperation. R. H. Ferguson, of Virginia, a graduate of the Ontario Agricultural College and with considerable experience in organizing cooperative associations in New Zealand and the Southern States, has been appointed extension professor in agricultural economics to carry on this work.

The state law relative to the annual report of the station has been so amended as to permit of its publication in installments, the size of edition of each installment up to 20,000 copies being fixed by the director. This change makes possible the publication of the station bulletins as parts of the annual report, and as this report is printed at the expense of the State will increase the station revenues available for other purposes.

A. H. Nehrling, instructor in floriculture in the University of Illinois, has been appointed assistant professor of floriculture in the college. John L. Byard, deputy apiary inspector since 1911, has been appointed superintendent of the apiary.

Minnesota University and Station.—An emergency appropriation of \$15,000 has been granted for hog cholera serum production. This increases the previous appropriations to \$25,000.

The home economics division has been reorganized to take effect August 1. Miss Juniata L. Shepperd and Miss Margaret J. Blair of the college of agriculture being transferred to the extension division as assistant professors of home economics, and Miss Bess M. Rowe of the extension division becoming assistant professor of home economics in the college of agriculture. Robert C. Ashby, of the Washington College and Station, has been temporarily appointed instructor in animal husbandry in the college and assistant in the station in connection with graduate work.

Nevada University and Station.—H. E. Murdock, of this Office, has been transferred from the Kansas Station where he was assistant in irrigation investigations at the Garden City Substation, and will carry on cooperative work with the station and give instruction in agricultural engineering in the university.

New Jersey College and Stations.—Recent resignations include the following: Herman H. Brehme as mosquito inspector, Morris A. Halprin as assistant poultryman, Glenn L. Pyle as assistant chemist, and Henry Jennings as assistant in soil surveying. The following appointments are noted: Willard C. Thompson, assistant in animal husbandry at the Arkansas University and Station, as assistant in poultry work, Arthur C. Ragsdale as assistant instructor in animal husbandry, Chas. H. Richardson, jr., who received the M. S. degree from the Bussey Institution during the past year, as assistant entomologist, W. Andrew Cray as sampler and assistant, and Joseph S. Obecný as field assistant in entomology.

New Mexico College and Station.—The annual farmer's week, given by the college January 19-24, had an enrollment of 116, which was about four times that of the previous year. In addition to the usual agricultural program and domestic science demonstrations, a striking feature was the cooperation of two railroads of the State, these furnishing lectures on the soil moisture problem and successful dry-land farming.

H. H. Simpson, head of the department of animal husbandry in the college and station, has resigned to accept a position as county agriculturist in Colorado.

New York State Station.—Recent appointments include Joseph W. Wellington, formerly of the Indiana Station, as assistant horticulturist, with special attention to truck crops and vegetables, and Clarence D. Parker as assistant chemist.

Ohio State University.—The extension of the present 2-year course over 3 years has been decided upon. Under the new plan the school year will be reduced, beginning October 15 and closing March 15, and thereby, it is believed, making it more convenient for young men actually engaged in farming. An additional year will then be provided to compensate for the shorter period.

A 5-year combination arts-agricultural course became effective January 21 through the cooperation of the college of agriculture with the University of Akron. Under the proposed plan the first 3 years will be spent at the Buchtel College of Liberal Arts of the University of Akron, and the remaining 2 years at the State University. At the end of the fourth year the degree of B. S. is conferred by the former institution and at the end of the fifth year that of B. S. in agriculture by the latter institution. It is announced that other Ohio colleges are considering the adoption of a similar plan.

Oregon College and Station.—A hog raising and dairying demonstration train was operated for two weeks in February in the western and southern parts of the State. The trains contained 7 cars, on one of which were 4 head of dairy cows of improved breeds and 1 animal to illustrate the small and otherwise undesirable Spanish stock. Attention was also given to dairy machinery and creamery equipment and to hog and dairy rations. It is estimated that nearly 40,000 people visited the train and some valuable results are already announced, particularly an increased interest in the building of silos.

The first public school cow demonstration in Oregon was held February 28 in Polk County. There was an attendance of about 200, comprising many teachers of various grades, parents, and children.

The system of industrial clubs is being rapidly extended in the various school districts. Each club may select not to exceed four lines of work from the following list: Corn growing, potato growing, vegetable growing, domestic art, canning, dairy herd record keeping, cooking and baking, poultry raising, pig

feeding, and manual arts. A series of district, county, and state contests is provided, and the prizes consist largely of trips to the college or the state fair, scholarships in short courses, and the like.

Dr. James Withycombe, director of the station for 14 years, has resigned to devote his time to his private interests. During his incumbency of the position, the station staff has increased from 12 to 57 members.

Clemson College and Station.—I. M. Mauldin has been reelected to the board of trustees, W. D. Evans, deceased, has been succeeded by Josiah Evans, and B. H. Rawl of the Dairy Division of this Department by W. D. Garrison, a former superintendent of the coast land substation.

Sidney S. Rittenberg has been appointed to the recently established position of agricultural publicist of the college. Recent appointments in the extension division include J. T. Watt and F. C. Hare as demonstration agents in live stock and poultry respectively.

The semiannual meeting of the county demonstration agents was held at the college February 12 to 14. The principal topic of discussion was the growing of winter cover crops in South Carolina. A farmer's short course was held from January 13 to February 10 with an attendance of 19 farmers.

South Dakota Station.—The station is planning to utilize in breeding experiments six sheep of a comparatively large breed secured by Professor Hansen during his recent explorations in Siberia. These sheep are tailless but have a fat rump, and it is claimed will live for weeks on the fat stored in the body. It is hoped that this feature may be transmitted by crossing with the native sheep, thereby reducing the occasional heavy losses on the range through hunger following severe snow storms.

Federal Commission on Vocational Education.—A joint resolution enacted January 20 authorized the President to appoint a commission of nine to consider the need and report a plan not later than June 1 next for national aid to vocational education. An appropriation of \$25,000 is included for the payment of the expenses of the commission. President Wilson has named as its personnel the following: Senators Smith of Georgia and Page of Vermont; Representatives Hughes of Georgia and Fess of Ohio; C. A. Prosser, secretary of the National Society for the Promotion of Industrial Education; John A. Lapp, legislative reference librarian of Indianapolis; C. H. Winslow of the U. S. Department of Labor; Miss Florence Marshall, principal of the Manhattan Trade School for Girls of New York City; and Miss Agnes Nestor of Chicago, formerly president of the International Glove Makers' Union.

Sixth International Dairy Congress.—This congress will be held at Bern, Switzerland, June 8-10. It will be divided into sections of hygiene, chemistry and bacteriology, the economics of dairying, and general commerce. The first of these sections will consider (1) rules for the veterinary supervision of milk and (2) can systematic selection with a view to improving milk-giving qualities injure the health and resisting powers of cows?

The topics for section 2 will be (1) the seeming uniformity in the methods of chemical analysis of cheese, and (2) the bacteria of milk and their utilization in dairying. Section 3 will consider the rational utilization of the by-products of dairying, and the supply of milk in the great centers of population with reference to economic and social conditions. The marketing of cheese will be considered in section 4, particularly the fixing of standards for the amount of fat in cheese and the means to be adopted to combat dishonest competition in the cheese trade.

A number of excursions will be made to dairies of the vicinity and from May to October the Swiss National Exposition will be held in Bern, in which con-

siderable attention will be given to dairying. Additional information may be obtained from the secretary-general, Dr. R. Burri, Liebefeld, Bern.

American Genetic Association.—Following the change in name of the American Breeders' Association to the American Genetic Association, the *American Breeders Magazine* has been rechristened the *Journal of Heredity*. The association has decided to hold meetings of the three research committees during 1914, but to postpone its next general meeting until 1915, when it will take place at the San Francisco Exposition.

Association of American Agricultural Colleges and Experiment Stations.—At a meeting held February 27, the executive committee of the association decided upon Washington, D. C., November 11-13, as the place and time for the next annual convention.

Agriculture at the British Association.—At the recent meeting of the British Association for the Advancement of Science, the agricultural section held one of its most successful sessions both as to papers and attendance. The presidential address of T. B. Wood, of Cambridge University, has been previously noted (E. S. R., 29, p. 404). Other papers were those on Methods of German Forestry by Frazer Story, The "May-sick" Disease of Cereals and Root Crops by W. E. Collinge, for which he has found sulphur and lime to be successful remedies, The Growing of Flax by Duncan Davidson, The Fungicidal Action of Bordeaux Mixture by B. T. P. Barker and C. T. Gimingham, the Utilization of Sewage in Agriculture by J. Grossman, The Partial Sterilization of Soil by Quick Lime by H. B. Hutchinson, The Protozoa of the Soil by T. Goodey, Nitrification in Pasture Soils by C. T. Gimingham, The Treatment of Peat with Aerobic Soil Bacteria by W. B. Bottomley, The Life History of *Eriophyes ribis* by Miss Adelaide M. Taylor, The Weeds of Arable Land by Dr. Winifred E. Brenchley, Varieties of Corn Spurry by Miss Armitage, and the Possibility of Partnership between Landlord and Tenant by Sir Richard Paget. Joint meetings were also held with the sections of botany and physiology, the former dealing mainly with problems in barley production and the latter with live stock problems.

Agricultural Essay Contest.—Awards have been announced in a contest organized by the Saddle and Sirloin Club of Chicago for the best essay from any graduate or undergraduate from an agricultural college in the United States on the subject Agricultural Education and the Farm. First place and a gold medal valued at \$100 were won by Miss Ethel Vanderwilt, a 1913 graduate of the Kansas College, while second, third, and fourth places, with memberships in the club, went respectively to H. J. Snider, a student in the University of Illinois, Prescott W. Thompson of the University of Missouri, and J. W. Stevenson of Illinois.

Boy and Girl Corn, Potato, and Canning Club Champions.—Over 75 farm boys and girls who, as members of agricultural clubs, have led their States in the production of corn, potatoes, cotton, and tomatoes, and in the home canning of their own garden produce, enjoyed a program from December 11-18, 1913, in Washington. The expense of the trip to Washington was borne by individuals and civic, commercial, and agricultural organizations in the States.

Of the corn club boys Walker D. Dunson of Tallapoosa County, Ala., not only leads the country, but is said to have broken the record for corn production by raising 232.7 bu. on an acre at a cost of only 19.9 cents per bushel. Of the girls the leader in canning and tomato work is Miss Clyde Sullivan of Lowndes County, Ga., who put up 2,464 cans from a yield of 5,354 lbs. of tomatoes on one-tenth of an acre.

New Agricultural School in Southern India.—A new agricultural school was opened in Bangalore, Mysore, in 1913, to turn out "efficient and intelligent

agriculturists." A 2-year course is provided the first year, including practical and theoretical agriculture, elementary and soil physics, elementary chemistry, biology, anatomy, and physiology, and farm mechanics. These subjects are continued during the second year, with additional work in mycology, agricultural engineering, veterinary science, and entomology.

Miscellaneous.—Among the recent appointments for the faculty of the George Peabody College for Teachers are Dr. J. L. Coulter as professor of rural economics, Dr. K. C. Davis, formerly of Rutgers College, as professor of agriculture, and William K. Tate, professor of elementary education at the University of South Carolina, as professor of rural education.

Prof. E. H. Starling has been awarded a medal by the Royal Society for Researches in Physiology. Professor Starling, at the physiological laboratory of the University College, London, has contributed many papers of interest to students of nutrition and of animal physiology, including the results of extended investigations on factors which determine the growth and activity of the mammary glands.

Plans are being prepared for new buildings at the Rothamsted Experiment Station, to be erected in commemoration of the centenary of the birth of Sir John Lawes and Sir Henry Gilbert. Efforts are being made to raise \$30,000 from private contributions, a like amount being then available from the Development Fund.

The Southeastern Agricultural College, Wye, has been given \$2,500 for the extension of its research department. The Development Commission is recommending a grant of \$30,000 for the completion of the college buildings, which are being erected at the Fruit Research Station at Malling, where 22 acres have been purchased by the Kent County Council.

An anonymous donor has pledged to the University of Leeds \$50,000 for the erection of an agricultural building. This will be utilized as the headquarters of agricultural education and research in Yorkshire, but much of the experimental work will be carried on at the Manor Farm, Garforth.

Dr. Chas. Crowther, lecturer in agricultural chemistry, at Leeds University, has been appointed professor and will have charge of experiments in animal nutrition for which a grant has been made by the Development Commission.

W. Lawrence Balls, botanist of the Egyptian Department of Agriculture, has resigned and for the present will devote himself to working up unpublished data on cotton accumulated since 1904.

Under the Swedish budget for 1914, a total of £592,000 is allotted to agriculture. This is an increase of £22,000 mainly for veterinary education and improved roads.

The enrollment in the school of agriculture of Cambridge University has now reached 320. The extension of the buildings has been practically completed.

A bequest of \$25,000 was made by the late Lord Strathcona and Mount Royal for the establishment of a chair of agriculture in the University of Aberdeen.

A separate minister of agriculture has been provided in the Union of South Africa, the first appointee being Hon. H. C. von Heerden.

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SUBSCRIPTION PRICE, PER VOLUME OF 9 NUMBERS, \$1

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VOL. XXX.

APRIL, 1914.

No. 5.

The change which has taken place in the volume of agricultural writings since the journal entitled *Agricultural Science* ceased publication in 1894 is strikingly illustrated by the present overcrowded condition of the many scientific journals which bear upon that field. At that time a single journal standing for agricultural science in the United States experienced difficulty in securing the necessary material and support to warrant continuance at the end of an eight-year experiment. Now the reports of agricultural investigations are scattered widely through scientific journals, with numerous organs for special branches, and workers in certain lines even find it necessary to look abroad for a suitable avenue of publication.

The volume of investigation of direct interest to agriculture has immensely increased, even in the last decade. This is largely because the work of the agricultural experiment stations, the National Department of Agriculture, and similar institutions has been greatly strengthened, yielding a large amount of material which is thought better suited to scientific journals than to bulletins and reports. But aside from this, the interest of a wide range of workers and teachers in the scientific aspects of agriculture has been wonderfully quickened, and the field has appealed increasingly to men not directly identified with the subject. There is now both a producing and a reading public of large size—an acceptance of economic papers on agricultural subjects in many avenues where they were formerly not favored.

The chief difficulty at present in securing publication for such papers in the leading scientific journals is the space limitation, and this is becoming serious. Practically all the journals are overloaded with material, with the result that publication is slow, a year or more sometimes elapsing after a paper is accepted. This is manifestly unsatisfactory, for promptness in publication is highly desirable, and interest is often diminished if the delay is long continued. It is discouraging to those who have important new work to report. The establishment of new journals seems to relieve the situation only temporarily. There must be a practical limit to the number of these, and the remedy for the present congestion must be largely looked for elsewhere than in indefinite extension of agencies.

There are two possible avenues of relief—a more critical examination and sifting of the papers submitted as to their merit, and the requirement of greater condensation in the papers accepted for publication. There is undoubted opportunity along both of these lines. Greater discrimination would not only relieve the congestion but would often result in benefit to the journals and to the majority of readers, and have the effect of establishing higher standards.

No one can follow the current periodicals of natural science without noting a great diversity in the manner of reporting scientific work, and a frequent lack of proportion between space and importance. A prolixity is conspicuous that often robs articles of much of their interest, a lack of concentration in style and upon the subject in hand.

The language of science as there expressed is often far from being the clear, direct, concise thing we naturally expect it to be, considering the nature of science itself. Order is its first rule, the establishment of systems of relationship. This would suggest that scientific papers, in comparison with other writings, should be characterized by an orderly, logical marshaling of facts, freed from extraneous and confusing details, and a critical weighing of the evidence in the light of theory and of what had gone before. If this were carried out it is feared that many of our scientific papers would be so simplified and condensed their authors would hardly recognize them and would perhaps feel that they had lost much of their technical character.

Too frequently the language of the scientific journal is quite the opposite. It is, to speak quite plainly, verbose, confused by more or less trivial details, and unnecessarily involved as a result of much discussion and speculation and the recital of objection to the work of others. It is as if the author recognized nothing else on the subject as available to the reader, and were attempting not only to record all of his data and their relation to previous studies, but the mental stages by which he arrived at his interpretations, and to meet in advance possible criticism of his procedure, his results, and his reasoning. Some papers are so diffuse and discursive that both a summary and a series of conclusions are deemed necessary by the authors to make their claims clear. Details are recorded which can only be of interest to the exceptional reader, and there is little evidence of the attempt to segregate matter of permanent importance from the trivial and incidental.

This is a severe stricture. It does not of course apply to all articles by any means, but to a considerable extent the practices referred to appear to mark a tendency in present journal literature. The writing habit has become thoroughly established, and with it the feeling that the published paper must form a complete record of work. There is much padding, doubtless unconsciously in many cases, but

the result is a prodigal abuse of the facilities for publication. Relatively small pieces of work are combined with theoretical discussions based mainly on the literature and analogies and speculation, resulting in disproportionately long papers of doubtful value for publication as a whole. These historical, theoretical, or controversial discussions are often quite academic, not strictly germane to the work reported, and better suited to a seminar or a scientific meeting than to a journal of progress.

Again there is an apparent confusion of the preliminary announcement with the paper which records the completed work up to a certain point. What is in effect only a preliminary announcement is expanded into a journal article by blocking out the field, reviewing previous work, and outlining the author's plans and activities, with some preliminary results. Such articles are often interesting, but they are hardly entitled to displace more mature articles in journals already overcrowded.

The most productive investigators are not by any means the most prolix or voluminous writers, and the influence which a worker is exerting in his branch of science is not necessarily measured by the space he occupies in the scientific press. A thorough and conclusive piece of research needs little argument to support its contentions and few labels to secure recognition of originality.

There seems to be among some workers, if not a wrong point of view an impractical one in regard to the publication of their scientific work, a conception of the essentials of a scientific paper which is disadvantageous to the writer and the reader alike.

Accounts of investigations are written first of all for the average scientific reader, or the majority of specialists who will be likely to be interested in them, rather than for the exceptional person. If they have not considerable breadth of interest their acceptance by a journal may be a matter of doubtful expediency. They are written to be read, to present in an effective way the product of investigation. The public has a right, as a rule, to expect that each paper will represent a discovery or a definite contribution, either of permanent fact or theory. It is not to be a mere record for the gratification of the writer; it is written for the reader, and hence it should show consideration of him—his needs, his time, his convenience. If it fails in this—if it is written entirely from the writer's own viewpoint and his desire to file a complete and detailed record which he can refer to, it will lose much of its interest and effectiveness, and may be a doubtful tax on publication facilities.

Journals of science are rarely privately supported or endowed but usually depend mainly on public contribution, either as membership or subscription fees. It is their mission, therefore, to print what is

presumably of interest to their particular public, assuming a general familiarity with the field represented. This implies a necessary limitation upon a journal, which the contributors of articles are expected to observe, and an obligation on the part of the editors if a publication of distinctive and high grade character is to be maintained.

It is to be assumed that the reader of technical papers know something of the subjects treated—that he is enough of a specialist to understand the bearings of the contributions. His primary interest in any particular case is in learning just what definite contribution the author has made, and how he has attained his end. He needs to have a sufficient general survey of the literature to make it clear where the author took up the subject. But this does not mean a complete review of all previous studies, dating back to the inception of the subject; and to give page after page of citation and summary lengthens the paper quite unnecessarily. Most scientific articles are not designed as monographs, and they are not written for the wholly uninitiated or to serve as text-books, but primarily to record new progress.

The first step is to secure an orderly and effective presentation, one which will enable the reader to get readily a connected and intelligent idea of the findings. This implies an orderly sequence in the mind of the writer, with ability to put himself constantly in the position of the reader. It requires painstaking work. Evidence of haste and lack of consideration in the presentation of scientific work is far more conspicuous than it should be. Years are spent in attaining results and only hours in presentation. Men often seem impatient of effort spent in trying to secure a clear, concise form of statement of their studies, and once their paper is written have a strong aversion to change; but it is upon this care and clearness that a just conception of the work and permanent recognition will largely rest.

It is said of the late Dr. S. W. Johnson that his writings represented the very best he was capable of. As his biographer says: "He was constitutionally incapable of turning off work hastily. Not only must his knowledge of the point involved be exhaustive and accurate, but each paragraph even if of minor importance was rewritten many times before it was parted with; when finally sent off it was as clear as it could well be made, representing the best he could do with the subject." In this day of much writing such an example is well worthy of imitation.

A printed paper is a permanent product. It can not be revised and rearranged and amplified like a lecture, but it must stand as it is issued. It is printed presumably because it contains something

worth while recording permanently. It represents a finished product as far as it goes. Hence it is well worth care and consideration.

The selection of material to be included is a vital matter, and one which many writers find most difficult. It is very rarely practicable, and nearly as rarely desirable, to include all the data secured in an investigation. There are always gradations in value; a great deal of that pertaining to intermediate steps is unessential in detail to the majority of readers and does not justify the expense of publication. Even in the more important aspects of the work all the figures and observations and determinations can rarely be published. Summaries must naturally be depended upon, with sufficient explanation to make clear the scope of the work done, the range of variation found, and the justification for the figures and deductions as given.

Not a few persons contend for the publication of practically all of their data—an essential transcript of their notebooks. Considering the present congestion of scientific journals such a contention is not a reasonable one. Rarely, indeed, are the data so intrinsically important as to warrant publication in full, and insistence on it deprives someone else of the privilege of publication and his prospective audience of the opportunity of reading. Many authors seem to have difficulty in judging what is the most important in their own articles. Undue emphasis is laid on trivial points or side issues. The results of large numbers of observations on a particular point are recorded merely to show the reader that they were made and that there is practical uniformity, whereas a statement of the extent of the observations, the nature of the range, and the general result would answer every reasonable purpose.

Again, detailed individual records are made of negative results, which in themselves have no permanent value not expressed in a brief text statement. Results are platted, although they confessedly show no definite relationship and permit of nothing more than negative inferences. The value of a negative result is not disputed, but when it merely indicates the author was not on the right track it rarely justifies detailing. Other data are recorded for their own sake, in the evident hope that someone will be able to make more out of them than the author apparently has, for he ventures no comment or deduction.

The desire of writers to make their published articles a complete record of their studies is often founded in the criticism of some readers, who seem to assume that if everything is not given something important is being withheld, a captious attitude which is difficult to combat successfully. Manifestly the reading public must take the author's word for it that he has made the number of observations

he claims and been honest in his presentation of results. The contention that the reader should be able to check up completely the author's findings from the published account is not believed to be generally justified. Few indeed would attempt such a proof of the work or search for flaws in details, and for those few the full original data can be much more cheaply preserved in notebooks and files, accessible when necessary.

However we may feel about the extent to which it is desirable to report scientific data, and it is admittedly a nice question, not determined by any set rules, the real question is what is feasible as far as the agencies for publication are concerned, and what is essential as far as the reader and the permanent value of the paper are concerned. The reader has a right to the scientific evidence, but evidently there must be a limit, suggested by the exigencies of the situation and dependent upon the intrinsic value of the details and incidental matter. The practical question is as to what is essential and may reasonably be expected; and it is believed to be quite clear that in many instances the practical bounds are at present overstepped.

These matters have a direct bearing on the standards of our scientific journals. Some of them are not all that could be desired, either from the standpoint of the science or the men who contribute to them. They are lax in their requirements and restrictions as to the character of the papers and their form, and remiss in the examination of manuscripts. It means little to have articles accepted by such journals, because the papers submitted are not subjected to discriminating scrutiny and selection made on actual merit. This robs these agencies of the stimulus and the influence which they might properly exert.

The effect is especially unfortunate in the case of the young worker in science, for it lowers his standards and gives him a wrong point of view. He is naturally ambitious to appear in print. The acceptance of immature or low-grade work tends to make him self-satisfied, and stands in the way of developing higher ideals. This is particularly desirable in agricultural science. The workers in that field need all the help they can get in raising their work to high grade.

Considerable of the scientific literature of to-day reflects a wrong idea of the nature of science and of what scientific writings should be. It is inexact, loose in statement, and based on superficial or inconclusive work. It does not bear evidence of the critical weighing of fact and expression which is expected in a scientific paper, and it mixes new findings with common knowledge in a manner to cause confusion. It shows a lack of discrimination on the part of the managers of such journals which is inexcusable at the present time and with the present supply of material.

More than thirty years ago Dr. Johnson wrote to a correspondent who had proposed the establishment of a journal: "In our stage of agricultural experimentation there is need of a moderately large amount of judicious criticism." This need has not passed. The absence of it is one of the conspicuous deficiencies in the present situation. There has been no established agency or forum for it, and those who have been most competent have seemed to shrink from indulging in it. A critical attitude toward method and results has been little in evidence.

It is easy to run along in grooves, doing things as they have been done, assuming that because they have been done that way for a long time they are correct and incapable of further improvement. It is easy to overlook the fact that work which is in the realm of research at one period becomes commonplace and lacking in originality or progress in another. It is perhaps natural to accept the findings of one time and build upon them, when in reality the problems have so changed that they need quite different treatment. But a certain measure of reflection and critical study is quite as necessary, and quite as productive in the end, as any other form of activity. It is an essential of progress, and it is an element in originality.

The scientific journal, through its board of editors, can exercise a useful function as a discriminating critic, especially if it will take pains to explain its real objections and indicate the weaknesses of papers it rejects. It can do much by way of suggestion, and if consistent in its attitude it can bring about a modified point of view as to the essentials of a scientific article.

The scientific societies offer another opportunity for constructive criticism. Papers and discussions of this nature would often be quite as profitable as a program made up entirely of reports of investigation and would represent advanced thought. One agricultural society has with profit given considerable attention to the critique of certain classes of methods. This might well be extended to other features which are vital to right experimenting and right thinking. The scientific meeting is an appropriate place for such discussion. Such a gathering gives opportunity for plain speaking, with less danger of offense because less likely to be misunderstood.

In the older sciences broad criticism is recognized as desirable and essential to progress, and is indulged in freely. The feeling is that if methods and theories and deductions will not stand the test of critical analysis the sooner this is known the better. The same view should prevail in relation to agricultural science. We need more sound, sympathetic, constructive criticism.

Such criticism should deal with conditions and tendencies as they are, and be made from a broad-minded point of view, not with the

object of tearing down, but in the manifest effort to improve and strengthen. It should, of course, be impersonal, and free from anything in the nature of an attack. It will avoid controversy. It will deal with principles rather than with individuals, and its effort will be to lead by the force of reason rather than harsh judgment. The manner in which it is done may have much to do in relieving it of odium and making it effective.

The task is a delicate one, and not to be lightly undertaken if good is to be effected. But it is an important and essential function, and one of great opportunity for usefulness and influence which will be farreaching. It is work for the very best talent. Encouragement and commendation have been the order of the past; to these should be added discrimination, a looking behind and beyond the returns in the endeavor by critical analysis to get at real values, just bases of estimate, and avenues for possible improvement.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

General chemistry of the enzymes, H. EULER, trans. by T. H. POPE (*New York and London, 1912, pp. IX+323, figs. 7*).—This is a translation of the revised and enlarged German edition of this work, which has been previously noted (E. S. R., 24, p. 608).

In regard to the action and regeneration of proteolytic enzymes, N. N. IWANOFF (*Trudy Imp. S. Peterb. Obshch. Estestvo. (Trav. Soc. Imp. Nat. St. Petersb.)*, 43 (1912), I, No. 2-3, pp. 95-106, 128).—It has been shown in previous work (E. S. R., 27, p. 108) that KH_2PO_4 increases the capacity of the proteolytic ferments in hefanol. Leucin and tyrosin have no influence on this process. An extract of hefanol was found to contain a proteolytic enzym. The action of KH_2PO_4 manifests itself by the production of an excess of peptone during the autolytic process. Adding KH_2PO_4 to a watery extract of hefanol which had been previously heated to from 75 to 80° C. or to gentle boiling produces a regeneration of the enzym peptase.

Studies on enzym action.—IV, Note on the occurrence of a urease in castor beans, K. G. FALK (*Jour. Amer. Chem. Soc.*, 35 (1913), No. 3, pp. 292-294).—The work, which continues that previously noted (E. S. R., 29, p. 713), indicates that castor beans contain a urease which is inactivated by heat in an aqueous solution or suspension.

Studies on enzym action.—V, The action of neutral salts on the activity of castor bean lipase, K. G. FALK (*Jour. Amer. Chem. Soc.*, 35 (1913), No. 5, pp. 601-616).—In this work, which is a continuation of that noted above, "the actions of neutral salts of the uni-univalent types, [the chlorids, iodids, fluorids, nitrates of sodium and potassium, potassium bromid, lithium chlorid, lithium nitrate, and sodium acetate], and the uni-bi- and bi-bivalent types, [the chlorids and nitrates of barium, calcium, and magnesium, sodium sulphate, potassium sulphate, sodium oxalate, manganous chlorid, manganous sulphate, and magnesium sulphate], were tested on the activity of a castor bean lipase preparation toward ethyl butyrate under comparable conditions. In every case the change in activity, whether increase or decrease, was found to be a continuous function of the concentration of the salt added. Decreased activities, as compared with aqueous solutions, were shown by all the uni-univalent salts, by the chlorids and nitrates of barium and calcium (except for the most dilute solutions) and magnesium, by sodium oxalate, and by dilute solutions of sodium sulphate.

"Increased activities were shown by dilute solutions of the chlorids of barium and calcium, by more concentrated solutions of sodium sulphate, by magnesium sulphate, and by the chlorid and sulphate of manganese. Potassium sulphate solutions gave the same results as purely aqueous solutions. . . . If an explanation of the retarding actions of the various salts be looked for, it may perhaps be found in the coagulation of the enzym (either alone or together with other substances) by the addition of the salts, the ions of which produce their

individual specific effects in each case. The unionized molecules may also take part in these reactions. The accelerations can not be explained in as simple a manner except, perhaps, for the cases where increased formation of active lipase (as by manganous salts) may be assumed."

Action of enzymes on hexose phosphate, V. J. HARDING (*Proc. Roy. Soc. [London]*, Ser. B, 85 (1912), No. B 581, pp. 418-422; *abs. in Jour. Chem. Soc. [London]*, 102 (1912), No. 601, I, p. 928).—The lipase from the castor bean and emulsin from almonds hydrolyze hexose phosphate slowly, and no hydrolysis at all is produced by the pancreas of the bovine. Zymine in an aqueous solution hydrolyzes hexose sulphate slowly. An autolyzed yeast juice was found strongly hydrolytic, and the enzyme producing it can be precipitated from the juice with alcohol and ether.

Nephelometry in the study of proteases and nucleases, I, P. A. KOBER (*Jour. Biol. Chem.*, 13 (1913), No. 4, pp. 485-498, figs. 2).—This describes a microchemical method in which the nephelometer is employed for following the digestion of a soluble protein, edestin. The instrument, which is described in detail, can be made from a Duboscq colorimeter.

"The readings of the nephelometer plotted against the ratios of the solutions, for a given standard solution and a given height of standard, seem to follow a uniform curve which can be expressed in the equation $y = \frac{s}{x} - \frac{s(l-x)k}{x^2}$ where y = height of 'unknown' solution, s = height of standard solution, x = ratio of solutions. The studies of various precipitants for protein and other organic substances in dilute solutions are in progress with the view of extending the application of this method generally. The ease, the rapidity, and the accuracy of the method would make it very useful, if the proper precipitants can be found. By proper dilution it can be used for large amounts of substances, and is sensitive enough to determine 0.00002 gm. with a percentage error of less than 2 per cent. The determination of casein in milk and the estimation of minute quantities of ricin are receiving immediate attention."

Nephelometry in the study of proteases, II, P. A. KOBER (*Jour. Amer. Chem. Soc.*, 35 (1913), No. 3, pp. 290-292).—"The nephelometer can be used for studying the digestion of casein when a 3 per cent solution of sulphosalicylic acid is used as a precipitant. This reagent does not precipitate amino acids, peptids, peptones, and urinary constituents under the conditions given for nephelometry. The nephelometric constant for casein with this precipitant was found to be 0.2."

On the purification of phosphatids, H. MACLEAN (*Bio-chem. Jour.*, 6 (1912), No. 4, pp. 355-361).—"The alcohol-soluble phosphatid of kidney and muscle is lecithin with a N:P ratio of 1:1. Though substances containing different amounts of nitrogen are obtained in the different extracts, the application of the method described—emulsification and precipitation with acetone—gives a single product of the nature of an ordinary lecithin. No alcohol-soluble substance having a higher percentage of nitrogen than that of lecithin has been found.

"From an aqueous extract of the nitrogenous impurity of lecithin a substance of basic nature crystallizes out; after the separation of this substance the mother liquor is very effective in curing polyneuritis (beri-beri). This explains the anomalous results of many observers who have endeavored to cure pigeons suffering from beri-beri by lecithin."

Tannic acid fermentation, I, L. KNUDSON (*Jour. Biol. Chem.*, 14 (1913), No. 3, pp. 159-184, figs. 2).—The results show that "tannic acid is toxic to a large number of fungi at relatively low concentrations. *Aspergillus niger* is a

more vigorous fermentative organism than *Penicillium* sp. The fermentation was found to be more rapid in the gall nut infusion than in the synthetic solution in which tannic acid was the only source of carbon. The presence of other organic compounds in the gall nut infusion protected to a certain extent the gallic acid. The addition of 5 per cent sugar did not protect the gallic acid, but simply increased the growth. The addition of 10 per cent sugar protected the gallic acid entirely. When gallic acid and cane sugar to the extent of 5.5 per cent and 10 per cent, respectively, were offered together, the cane sugar was elected and the gallic acid left in the culture solution. Fermentation can take place under anaerobic conditions, and 1 mg. of mycelium is sufficient to effect the transformation of 2.706 gm. of tannic acid in 10 days. In an approximately 15 per cent solution of tannic acid, fermentation was most rapid when the tannic acid alone served as the source of carbon, and when aerobic conditions were maintained; yet the method of fermentation is wasteful from the standpoint of an economical yield of gallic acid."

See also a previous note (E. S. R., 26, p. 203).

Tannic acid fermentation.—II, Effect of nutrition on the production of the enzym tannase, L. KNUDSON (*Jour. Biol. Chem.*, 14 (1913), No. 3, pp. 185-202).—Previously noted from another source (E. S. R., 27, p. 408).

A preliminary study of the biochemical activity of *Bacillus lactis erythrogenes*, M. LOUISE FOSTER (*Jour. Amer. Chem. Soc.*, 35 (1913), No. 5, pp. 597-600).—In addition to the work previously reported (E. S. R., 26, p. 775), it is shown "that the action of *B. lactis erythrogenes* on milk is progressively catabolic; the native proteins are split with the ultimate formation of monoamino and diamino acids. This proteolytic change may be caused by an enzym. A soluble ferment which was precipitated with alcohol split the carbohydrate with the production of formic and acetic acids. This would seem to indicate the presence of an intracellular enzym which has been set free by the alcohol when it has destroyed the organism. Accompanying these changes is the production of a pigment which causes a coloration varying from red to dull brown, according to the strain. This pigment can be extracted with amyl alcohol and is extracellular, for it is contingent upon the life of the organism."

A reinvestigation of the velocity of sugar hydrolysis.—II, The rôle of water, M. A. ROSANOFF and H. M. POTTER (*Jour. Amer. Chem. Soc.*, 35 (1913), No. 3, pp. 248-258).—In a former communication^a it was shown that sugar hydrolysis is strictly unimolecular with respect to the sugar itself. In the present contribution it is stated that "water plays a double rôle in the reaction. On the one hand it takes part in the reaction and contributes to its velocity according to the law of mass action; on the other hand it acts as a negative catalyzer by its dissociating power. With respect to this retarding effect, the reaction is shown to follow a catalysis principle which is also obeyed by several other reactions investigated within the past few years."

The development of fat in the black walnut (*Juglans nigra*), II, F. M. McCLENAHAN (*Jour. Amer. Chem. Soc.*, 35 (1913), No. 4, pp. 485-493, fig. 1).—This is a continuation of the investigations previously noted (E. S. R., 21, p. 628) and includes a preliminary study of the relation of potassium and phosphorus to the fat and lipoids as they occur in developing the seed coat and ovule of the walnut. The curve of the development of the fats in the ovule of the black walnut is only complementary to the water-soluble portion of the hot alcohol-ether extract.

"The earliest history of the ovule would indicate a great preponderance of phosphatids over fats, which may be noted by an inspection of the backward

^a *Jour. Amer. Chem. Soc.*, 33 (1911), No. 12, pp. 1911-1924, fig. 1.

extension of the phosphatid curve and that of fats in the ovule. The phosphatids linger in the developing ovule until August 14, but their relative importance is insignificant after the fruit has changed from a limpid liquid to a jelly. This is the case with the seed coat also, except that their importance seems to be nil after the June 28 sample. It will be seen that the early life of the ovule is conditioned by the presence of a relatively large content of potassium, which becomes less and less important as the fruit advances toward maturity, but even on September 4 there is a content equal to 0.18 per cent of the total solids.

"The nature of the tissue of the seed coat is such that it is either not penetrable by tannin or contains substances that disrupt the tannin molecule into fragments that under one form or another are able to penetrate the tissue. The line of limitation of tannin penetration in the seed coat is so clearly marked, and yet the premises for a definite conclusion are so fragmentary, that this feature of the physiology of the plant life deserves a special study before one should speak finally in reference to the rôle that fats and tannins play with reference to one another."

Zygadenin.—The crystalline alkaloid of *Zygadenus intermedius*, F. W. HEYL, F. E. HEPNER, and S. K. LOY (*Jour. Amer. Chem. Soc.*, 35 (1913), No. 3, pp. 258-262, figs. 2).—This has been adequately noted from another source (*E. S. R.*, 28, p. 506).

Zygadenin.—The crystalline alkaloid of *Zygadenus intermedius*, S. K. LOY, F. W. HEYL, and F. E. HEPNER (*Wyoming Sta. Bul.* 101, pp. 91-98, figs. 2).—A reprint of the above article.

Some constituents of the leaves of *Zygadenus intermedius*, III, F. W. HEYL and F. E. HEPNER (*Jour. Amer. Chem. Soc.*, 35 (1913), No. 6, pp. 803-811; *abs. in Science*, n. ser., 37 (1913), No. 957, pp. 678, 679).—Since poisonous properties have been ascribed to the resin *Z. venenosus* by Tyrode, the investigation was extended to the search for toxic resins in *Z. intermedius*. No toxic substance was isolated, although an extensive investigation was made with the plant with the methods elaborated in the Wellcome Research Laboratories of London. Some physiological tests were also made with the resin upon dogs by Mendel of Yale University, which showed that the resin was nontoxic.

From an ether solution of the tartaric acid fraction of the resin a yellow crystalline substance was obtained, which melted at 317 to 318° C. with decomposition and corresponded in its properties to quercetin. An alkaloid was noted in extracts from the tartaric acid solution in this investigation, but the product obtained could not be made to crystallize. Physiologically it did not show any marked toxic properties when 0.1 gm. was given subcutaneously to guinea pigs.

Other substances isolated were dextrose, phytosterol, a hydrocarbon hentriacontane, oleic and linoleic acid, and isolinoleic acid. In the ether extract of the resin a neutral substance was found but to which no formula could be assigned. In this fraction a polyhydric alcohol similar to ipuranol was noted.

Analyses of the ash constituents present in the plant are given. For previous work see above.

Estimation of potassium in potassium silicate, E. WILKE-DÖRFURT (*Ztschr. Analyt. Chem.*, 51 (1912), No. 12, pp. 755-760; *abs. in Jour. Chem. Soc. [London]*, 102 (1912), No. 602, II, p. 1211).—"For the estimation of potassium in commercial potassium silicate ('phonolith') the original Lawrence Smith method (ignition with calcium carbonate and ammonium chlorid, boiling the mass with water, etc.) is recommended. Verwey's modification of this process, which dispenses with the removal of the calcium before proceeding to the separation with platinum, gives results largely in excess of the truth."

Micro-chemical detection of juglone in walnuts (*Juglans regia*), O. TUNMANN (*Pharm. Zentralhalle*, 53 (1912), No. 36, pp. 1005-1010, figs. 5; *abs. in*

Jour. Chem. Soc. [London], 102 (1912), No. 601, II, p. 1110).—If the green shell of an unripe walnut is immersed in a copper acetate solution, crystalline needles of the copper-juglone compound begin to form immediately in the cells, while the hydrojuglone, which exudes from the cells, forms a precipitate. "If the section is now washed with water and treated with chloral hydrate solution the masses of crystals which at first appeared black become red. On subjecting a section of the tissue to the action of nitric acid vapors, black crystals (juglonic acid?) form in the cells. A further test consists in treating a section on a microscope slide with a drop of anilin and placing a cover glass over it; after the lapse of a few minutes, reddish-brown crystals form in the anilin near the edges of the cover glass. The sections may be also subjected to micro-sublimation and the sublimate tested with the above mentioned reagents."

The crystals give a red coloration with sulphuric acid, reddish with dilute potassium hydroxid, a violet coagulum forming at the edge of the drop, and violet-blue with ammonia gas.

Further researches on the testing of oiled paprika. A. DE SIGMOND and M. VUK (*Kísérlet. Közlem., 15 (1912), No. 2, pp. 289-292*).—Continuing the work previously noted (*E. S. R., 27, p. 715*), the authors have tried a method for detecting added oil in paprika which consists in leaching the surface oil with water and determining the ether extract in the resulting solution. The method gave unsatisfactory results when it was used for both pure and oiled goods. The iodine numbers of the oils and natural and oiled goods were unreliable.

Some other experiments showed that various solvents extract different quantities of substances from the pericarp of the paprika fruit, e. g., ethyl ether 5 per cent, ethyl alcohol 18.9 per cent, and methyl alcohol 34.3 per cent. The latter results were obtained by macerating 3 gm. of paprika with 100 cc. of the solvent for 48 hours at room temperature of from 20 to 22° C.

Characteristic color reaction of soy-bean oil, L. SETTIMI (*Abs. in Jour. Chem. Soc. [London], 102 (1912), No. 601, II, p. 1108*).—The reaction is as follows:

To 5 cc. of oil in 2 cc. of chloroform add 3 cc. of a 2 per cent aqueous solution of uranium nitrate, and shake. If the sample is soy-bean oil, a lemon-yellow-colored emulsion is produced. Some samples of olive oil gave a faint yellow emulsion, but all other oils tried showed white. Soy-bean oil gave the remaining usual reactions for seed oils while olive oil did not.

The detection of shells in cacao and its preparations, C. ULRICH (*Der Nachweis von Schalen im Kakao und in seinen Präparaten. Diss., Herzogl. Tech. Hochsch. Carolo Wilhelmina, Braunschweig, 1911, pp. 97*).—In addition to what has been previously reported (*E. S. R., 29, p. 205*), it is shown that Filsinger's and Drawe's elutriation methods can be used for detecting additions of cacao shells from 7.5 per cent up in normal cocoa which contains 30 per cent of fat and water, providing the sample under examination is finely powdered and the appropriate correction factors are applied in the calculations.

The Matthes and Müller modification of König's method for crude fiber is not deemed of value for practical conditions, as it will not detect less than 27.5 per cent of shell in normal cocoa. The pentosan detection according to the Tollens and Kröber method is also imperfect as it will note only 25 per cent or upwards of shells. The iodine value of the cacao fat gives no clue so far as adulteration is concerned.

Numerous analyses of raw and prepared materials are included.

The relative value of indicators in the acid titration of wines, F. MARRE (*Rev. Gén. Chim., 15 (1912), No. 13, pp. 242, 243; abs. in Jour. Chem. Soc. [London], 102 (1912), No. 601, II, p. 1106*).—As an indicator in the analysis of

colored wines, a mixture is recommended of "a cold saturated solution of phenolphthalein in alcohol (7 gm. in 90 cc. of alcohol) and fluorescein (1.2 gm.) dissolved in 100 cc. of cold alcohol. To 5 cc. of clear (or filtered) wine, 5 drops of the phenolphthalein and 3 drops of the fluorescein solution are added, the mixture is just heated to boiling, diluted with 5 cc. of water, and subsequently titrated."

The determination of phosphoric acid in wine, C. VON DER HEIDE and J. SCHWENK (*Ztschr. Analyt. Chem.*, 51 (1912), No. 10-11, pp. 615-627).—The authors state that in wine phosphoric acid occurs as a primary phosphate and as organic phosphoric acid. The latter is only a small part of the total acid. With the Philippe and Duperthuis method both kinds can be separated, but if the phosphoric acid is precipitated by the von Lorenz method only the inorganic form is obtained. The Grete method yields the total amount of phosphorus. The total amount of phosphoric acid can also be determined in the ash of the wine, and the ashing may be done either by the wet or dry method. For table and sweet wines, musts, or yeast, no addition of soda or nitric acid for the purpose of preventing losses during ashing is necessary.

The preferable method for determining phosphoric acid in wine is given as follows: Fifty cc. of the wine is evaporated and carbonized in the usual manner. Wines containing a large amount of sugar are allowed to ferment previous to determining the phosphoric acid. The carbon is then extracted with water, ashed, dissolved in nitric acid, the original water extract of the ash added, and filtered. The ash can be burned in an electric oven to whiteness in one operation. The phosphoric acid is determined in the resulting solution.

The German official method is deemed unsatisfactory.

Estimation of casein and lactose in milk, R. MALENFANT (*Jour. Pharm. et Chim.*, 7. ser., 6 (1912), No. 9, pp. 390-397; *abs. in Jour. Chem. Soc. [London]*, 102 (1912), No. 602, II, p. 1218).—"Ten cc. of the milk is added to a mixture consisting of 25 cc. of 65 per cent alcohol and 3 drops of glacial acetic acid, and after shaking for about 30 seconds, the precipitated casein is collected on a weighed filter and washed with 65 per cent alcohol. The filtrate and washings are collected in a 100 cc. flask, diluted with water to the mark, and the lactose is estimated in a portion of this solution by titration with Fehling's solution. The casein is then washed with boiling 95 per cent alcohol, boiling acetone, and ether, dried for 7 hours at 100° C., and weighed. The weight found is multiplied by 0.925 to obtain the quantity of casein present."

The iodoform reaction of lactic acid, C. NEUBERG (*Biochem. Ztschr.*, 43 (1912), No. 5-6, pp. 500-507; *abs. in Jour. Chem. Soc. [London]*, 102 (1912), No. 601, II, p. 1106).—The author finds that the α -lactic acid gives the iodoform reaction, and that the other substances giving it are pyruvic acid, aldol, β -hydroxybutyric acid, quercitol, and inositol. The statements in the text-books are consequently deemed incorrect.

About the value of the methods for detecting watered milk, R. SANFELICI (*Staz. Sper. Agr. Ital.*, 45 (1912), No. 5-6, pp. 321-375).—This is a detailed and critical review of the methods proposed for the detection of watered milk. Numerous samples of milk were examined as regards specific gravity at 15° C., the fat-free solids, and the specific gravity of the serum. The specific gravity of the serum is considered of great value for added water detecting.

Interference of hydrogen peroxid with the milk tests for formaldehyde, H. D. GIBBS (*Philippine Jour. Sci.*, Sect. A, 7 (1912), No. 2, pp. 77, 78; *abs. in Jour. Chem. Soc. [London]*, 102 (1912), No. 602, II, p. 1218).—"The Hehner and Leach tests for the presence of formaldehyde in milk are unsatisfactory in the presence of hydrogen peroxid, although the Rimini reaction may still be

employed. After removal of hydrogen peroxid by means of reducing agents, positive tests may, however, be obtained."

The extent of the proteolysis in cheese determined by formol titration, O. GRATZ (*Kisérlet. Közlem.*, 15 (1912), No. 2, pp. 281-288).—The formol (formaldehyde) titration method (E. S. R., 19, p. 808) as a means for determining the extent of proteolysis measured by the amount of carboxyl groups is deemed satisfactory for studying the proteolytic changes taking place in cheese. The results obtained by this investigation compare well with the figures given for monoamino acids by precipitation with phosphotungstic acid.

A few observations on starch grains and the use of the counting chamber as an aid for the quantitative determination of adulteration in vegetable powders, C. HARTWICH and A. WICHMANN (*Arch. Pharm.*, 250 (1912), pp. 452-471).—This deals with the use of the counting chamber for determining stone cells and clove stems in clove powders, sandal wood in saffron powder, and the variety of starches in a mixture.

About the chlorzinc-iodid reaction of cellulose, I. V. NOWOPOKROWSKY (*Isr. Imp. St. Peterb. Bot. Sada (Bul. Jard. Imp. Bot. St. Petersb.)*, 11 (1911), No. 4-5, pp. 109-116).—As this reaction, while reliable, is very capricious, a study was made to determine the best procedure for applying it, and consequently of the behavior upon cellulose and its products of the individual constituents which make up the reagent.

In most of the chlorzinc-iodid solutions the amount of potassium iodid is so large that the coloration obtained is not typical, and at times it is violet or red instead of blue. If small amounts of potassium iodid and iodine are taken, the color becomes typical, but the intensity of the color suffers.

It is stated that the most satisfactory results can be obtained by the use of separated solutions. The preparation is treated for a few seconds with 1 drop of a 1 per cent iodine and 1 per cent potassium iodid solution and then with a strong zinc chlorid solution (2 parts of zinc chlorid to 1 part of water). The preparation is dropped into the zinc chlorid solution, and it must be colored intensely blue in from 1 to 1½ minutes. If it is not colored properly, a little potassium iodid is added.

The method is given preference over those of Schultze, Behrens, or von Höhnelt.

Acidity in silage: Method of determination, C. O. SWANSON, J. W. CALVIN, and E. HUNGERFORD (*Jour. Amer. Chem. Soc.*, 35 (1913), No. 4, pp. 476-483).—Investigators, as a rule, determine the acidity in silage by extracting the acid with either water or alcohol and titrating with a standard alkali solution, using phenolphthalein as an indicator. Esten and Mason (E. S. R., 27, p. 204), Hart and Willaman (E. S. R., 28, p. 109), and Dox and Neidig (E. S. R., 29, p. 712) used water as the solvent, although with certain kinds of silage it yields an extract which is difficult to filter. Alcohol as a solvent has not been thoroughly studied by experiment station chemists.

This work was done on several kinds of silage, and on different samples of the same silage. In all cases, however, the ratio between the silage and the solvent was 1:10. In order to make the results comparative, they were calculated to acetic acid. The presence of carbon dioxide in silage had little effect upon the acidity figures, although it is believed advisable to use recently boiled water for the extraction. Fineness of grinding was found to have considerable influence upon the ultimate results.

Upon comparing the acidity in the water and alcohol extracts, it was noted that alcohol was the more efficient solvent, but 50 per cent alcohol was nearly

as effective as 95 per cent. The weaker alcohol extracted 0.06 to 0.09 per cent less acid than the stronger, but gave an extract which was easier to filter and titrate, which may account for the difference in the titration figures. "Since equally uniform results are possible with either the water or the alcohol extraction, and since the alcohol extracts contain a high percentage of acidity in every case, it must follow that some of the acids in silage which are soluble in alcohol are insoluble in water. The amounts of these insoluble in water are different in the various kinds of silage, corn silage having the largest relative amount."

The conditions of extraction—shaking by hand or machine—were also studied.

A method of detecting arsenical compounds in fungicidal and insecticidal mixtures, L. M. GRANDERYE (*Vie Agr. et Rurale*, 2 (1912), No. 27, p. 34; *abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases*, 3 (1912), No. 7, p. 1679).—In order to determine quickly whether an insecticide or fungicide contains arsenic, the following simple process is recommended:

"Four spoonfuls of good white vinegar are put into a tumbler, and some crystals of soda are added gradually until the resulting effervescence ceases. The liquid is then poured into an iron ladle which is heated till nearly all the water has evaporated; when this point is reached, a few grams of the compound suspected of containing arsenic are mixed with the contents of the ladle and heated still more, until the mass is desiccated. If arsenic is present, a gas is set free with a strong repulsive odor of garlic."

METEOROLOGY—WATER.

Weather and its causes, E. C. BARTON (*Queensland Geogr. Jour., n. ser.*, 26-27 (1910-1912), No. 12-13, pp. 16-37, fig. 1).—General weather phenomena are explained, and the use of kites and balloons in upper air exploration is discussed.

The shifting of climatic zones as illustrated in Mexico, E. HUNTINGTON (*Bul. Amer. Geogr. Soc.*, 45 (1913), Nos. 1, pp. 1-12, figs. 3; 2, pp. 107-116).—Observations are reported upon which is based a theory that there have been shiftings of climatic zones of more or less intensity at varying intervals of time. "In the irregular little cycles which cause the climate, or weather, of one year to differ from that of the next, the course of the storm tracks varies, moist periods in subtropical regions being characterized by southerly tracks. In longer periods . . . the same sort of variation is seen on a larger scale. Therefore it seems reasonable to suppose that in still longer and more important periods the same thing occurs with a correspondingly increased intensity."

The theory "assumes that a given change of climate will produce opposite effects on the northern border of the subtropical zone of aridity as compared with the southern border. If this is so, it might be expected that the fluctuations of the lakes around Mexico City would indicate conditions exactly the reverse of those recorded in the growth of the sequoias in California. This, however, is only partially the case."

Weather conditions, G. HARCOURT (*Ann. Rpt. Dept. Agr. Alberta*, 1912, pp. 37-48).—Monthly and annual maximum and minimum temperatures and sunshine for 1912 and precipitation for 1899 to 1912 at a number of places in Alberta are given in tables.

Monthly Weather Review (*Mo. Weather Rev.*, 41 (1913), Nos. 9, pp. 1285-1464, pls. 13; 10, pp. 1465-1637, pls. 9, figs. 12).—In addition to the usual climatological summaries, lake levels, weather forecasts and warnings for

September and October, 1913, river and flood observations, lists of additions to the Weather Bureau library and of recent papers on meteorology, a condensed climatological summary, climatological tables and charts, and notes on the rivers of the Sacramento and Lower San Joaquin watersheds during the months of September and October, 1913, by N. R. Taylor, and on streams and weather of the Upper San Joaquin watershed, by W. E. Bonnett; these numbers contain the following special papers:

No. 9.—Relation of precipitation to tree growth, by M. N. Stewart (see p. 445); Thunderstorm at Charleston, S. C., September 9, 1913, by J. H. Scott; The Storm of September 3, 1913, in Eastern North Carolina, by L. A. Denson; The September Hot Wave in Los Angeles, Cal., by F. A. Carpenter; and Notes on the Severe Heat and Drought Over the Middle West During the Summer of 1913 (illus.), by P. C. Day et al.

No. 10.—Heavy Rainstorms of 1913 at New York City, by C. D. Reed; Tornadoes in Wisconsin on October 10, 1913, by W. R. Bormann; Rainfall and Spring Wheat (illus.), by T. A. Blair (see p. 418); The Tornado of October 9, 1913, in Nebraska, by G. A. Loveland; The Tornado of October 9, 1913, at Lebanon, Kans., by E. V. Bower; Heavy Rains and Resultant Floods in Southwestern Louisiana September 26 to October 4, 1913, by I. M. Cline; Storms in Southeastern Louisiana October 23, 1913, by I. M. Cline; and A Meteorological Study of Parks and Timbered Areas in the Western Yellow-Pine Forests of Arizona and New Mexico (illus.), by G. A. Pearson.

A return to normal atmospheric transparency, H. H. KIMBALL (*Jour. Wash. Acad. Sci.*, 4 (1914), No. 2, pp. 17-25, fig. 1).—This paper presents evidence derived from observations at Mount Weather, Va., relative to the gradual precipitation from the air of dust from the Katmai Volcano, June 6 and 7, 1912.

Summarizing the results, it is stated that "pyrheliometric and polarimetric observations unite in indicating a gradual increase in atmospheric transparency since the marked minimum in August, 1912. This increase is probably due to the precipitation from the atmosphere of the dust that was introduced into high levels by the eruption of Katmai Volcano in June, 1912.

"At the same time, the solar and the antisolar distances of the neutral points of Babinet and Arago, respectively, indicate that there may still be traces of this dust in the upper atmosphere.

"The duration of the Katmai dust cloud appears to have been less than the duration (2 years) of the dust cloud that followed the eruptions of 1902-03, and markedly less than the duration (3 years) of the dust cloud that followed the eruption of Krakotoa in 1883."

For notes on the effect of these dust clouds upon temperature and evaporation at the earth's surface, see previous articles (E. S. R., 29, p. 720).

The Ohio and Mississippi floods of 1912, H. C. FRANKENFIELD (*U. S. Dept. Agr., Weather Bur. Bul.* Y, pp. 25, pls. 42).—This bulletin notes the extent of the Mississippi drainage basin, the causes and frequency of Mississippi River floods, and reports the origin, progress, duration and crest stages of the Mississippi and Ohio floods of 1912. Comparative data of crest stages show that new high water marks were established from Cairo to New Orleans, except in the vicinity of Vicksburg where a higher stage was prevented by crevasses.

Data from the 1912 flood and floods in 1903, 1897, and 1882 show a steady increase in flood height below Cairo without a corresponding increase in quantity of precipitation, which is attributed to the influence of levees. Since the duration of the 1912 flood was also greatest, it is concluded to be relatively the most important.

A number of weather maps, precipitation charts, and hydraulic and hydrographic diagrams accompany the report.

Rainfall and spring wheat, T. A. BLAIR (*Mo. Weather Rev.*, 41 (1913), No. 10, pp. 1515-1517, figs. 3).—The rainfall and yield of wheat in the three great spring wheat producing States of Minnesota, North Dakota, and South Dakota are compared in tables and charts. It is shown that the total precipitation of May and June is, in most years, probably the largest factor in determining the wheat yield in the two Dakotas but not in Minnesota.

On the loss of water due to evaporation, percolation, and absorption, with special reference to the Brisbane water supply, G. PHILLIPS (*Queensland Geogr. Jour.*, n. ser., 26-27 (1912), No. 12-13, pp. 1-15, fig. 1).—The author briefly reviews data from several sources which indicate the enormous losses of water through evaporation, percolation, and absorption by soil and vegetation in various localities, particularly Queensland. He concludes that the evidence given is sufficient to show "how difficult it is to determine with anything like exactitude the quantity of water that any given area may be depended upon to yield, or that can be conveyed by natural or artificial channels other than closed conduits such as pipes.

Silt in the Rio Grande, W. W. FOLLETT (*U. S. Dept. State*, pp. 102, pl. 1; *abs. in Engin. News*, 71 (1914), No. 1, pp. 18-21).—This is a compilation and discussion by the author, as consulting engineer of the International Boundary Commission and advisory engineer of the Commission for the Equitable Distribution of the Waters of the Rio Grande, of silt determinations of Rio Grande waters made prior to January 1, 1913. Methods of procedure are described.

The data show that the silt is a factor which must be seriously considered in the building of any reservoir on the Rio Grande. The most prominent fact brought out is that no hard and fast rule can be made as to what silt the river will carry in future years. During the 16 years' observation the actual percentage of silt in the river water varied from 0.76 to 4.14, with an average of 1.66 per cent.

Chlorin in rain water (*Agr. Students' Gaz.*, n. ser., 16 (1913), No. 5, p. 174).—During the year ended September 30, 1913, the rainfall at Cirencester was 33.02 in., containing chlorids equal to 40.78 lbs. per acre of common salt.

Lead-poisoning of a village through the water supply, M. NEISSER (*Gesundh. Ingen.*, 36 (1913), No. 51, pp. 920-922).—Attention is drawn to a case in which an entire small rural community was stricken with lead-poisoning through the water supply. Service pipes, house connections, and some of the plumbing were of lead. Tests of the spigot water showed a considerable lead content, which increased with the length of the lead house connection. The water from the supply contained considerable oxygen and free carbon dioxide. The lead in the water appeared to be either in colloidal or insoluble form, as all evidences of it were removed by filtering through a Berkefeld filter. The author also briefly reviews other studies of lead poisoning, and concludes that if water has a carbonate hardness of 7 degrees or more it will hardly attack lead pipe, but if the hardness is only 3 degrees or less and considerable oxygen, free carbon dioxide, and some nitrates are present, one may expect comparatively strong lead solutions.

Introduction to the mycology of water supplies and sewage, A. KOSSOWICZ (*Einführung in die Mykologie der Gebrauchs- und Abwässer*. Berlin, 1913, pp. VII+222, figs. 62).—This work is meant to serve two purposes: (1) As a guide for chemists, botanists, and technologists, in beginning the study of hydrobiology and the purification of water supplies and sewage, and (2) as a reference book for bacteriologists, hygienists, and hydrobiologists. For the first pur-

pose several different processes of water and sewage purification are described and illustrated, and the fundamental principles of their operation emphasized. For the second purpose an exhaustive review of technical literature on the subject is given, bringing out the most salient features developed.

The germicidal action of ultraviolet light in clear, turbid, and colored water, M. OKER-BLOM (*Ztschr. Hyg. u. Infektionskrank.*, 74 (1913), No. 2, pp. 197-247).—Investigations are reported on the practicability of water sterilization by ultraviolet light, in which the retarding action on the germicidal action of the ultraviolet light of turbidity and coloring in the water within natural limits was particularly tested. *Bacillus coli communis*, *B. paratyphosis B*, *Vibrio el-tor*, and *B. peptonificans* served as test bacteria.

In tests of a commercial drinking water sterilizer, with the water perfectly clear and colorless, sterility with regard to the test bacteria was obtained when the water passed through the apparatus at a speed of from 50 to 90 liters (13.2 to 23.8 gals.) per hour, and had a bacterial content of about 10,000 per cubic centimeter. The exact limits for the germicidal effect of the apparatus relative to speed and bacterial content of the water were not established. No great difference was observed in the resistance of the different test bacteria to the germicidal action of the ultraviolet rays, but the water bacteria were more resistant than the test bacteria. Clay turbidity reduced the germicidal effect of the ultraviolet rays, but with a low turbidity the retarding action was small.

Large quantities of peat extract coloring also reduced the germicidal action, but weak mixtures had little retarding effect. Medium quantities of humus substances in the treated water did not especially hinder germicidal action. Barium sulphate turbidity and vesuvin coloring had little retarding effect. A bibliography is appended.

SOILS—FERTILIZERS.

The effect of heat on Hawaiian soils, W. P. KELLEY and W. McGEORGE (*Hawaii Sta. Bul.* 30, pp. 38).—In the investigations reported in this bulletin 12 different soils, representing a wide range of types and agricultural conditions, were heated to 100 and 250° C. and to ignition, and the effect of these treatments on the solubility in water and fifth-normal nitric acid of the mineral constituents and on the form and loss of the soil nitrogen was studied.

The results were variable, but in many cases there was an increase in the solubility of the inorganic soil constituents as a result of heating. An important exception was a decrease in solubility of lime and magnesia at the higher temperatures and of iron at the lower temperatures.

The solubility of the constituents of soils used in aquatic agriculture was found to be abnormally high, but when these were dried this was not so pronounced, and when such soils were heated after drying they were affected much the same as dry-land soils.

The conclusion is reached that no single factor is sufficient to explain fully the solubility effects resulting from heating. It is thought, however, that this is due mainly to physical causes, more particularly to the action of the heat in evaporating the water films surrounding soil particles which hold the soluble matter under high pressure, thus leaving the soluble constituents deposited on the surface of the particles in condition to be more readily taken up when water is again added. It is also recognized that heating may benefit soils by improving aeration.

Heating to 200° C. or above caused a loss of approximately 25 per cent of the total nitrogen of the soil, practically destroyed all nitrates, and stopped nitrification, but it resulted in an abnormally large production of ammonia,

mainly from the monamino acid group. This increase in the production of ammonia and the checking of nitrification were also observed in field soil on which brush had been burned.

Rice soils of Hawaii: Their fertilization and management, W. P. KELLEY (*Hawaii Sta. Bul. 31, pp. 23*).—Studies of the origin, composition, fertilizer requirements, and management of these rice soils are reported.

It is shown that the Hawaiian rice soils are of basaltic origin, but also contain small amounts of coral limestone. They are generally clay loams containing approximately equal quantities of fine sand, silt, fine silt, and clay. In chemical composition the soils are quite uniform except those from the Waikiki district, which contain abnormal amounts of magnesia, and those from the Kaulaunui district, which are highly organic. In general, the nitrogen and phosphoric acid are high, while the potash is low, due to leaching from the soil.

Fertilizer experiments carried on through seven crops showed that the application of 150 lbs. per acre of ammonium sulphate produced notable increases in the yield, but 300 lbs. per acre proved the more profitable. Potash and phosphoric acid were without effect. Application of ammonium sulphate to both the spring and fall crops was considerably more profitable than application to the spring crop only. The residual effects on the fall crop from the spring application were small. The immediate effects from application to the fall crop were about the same as those obtained with the spring crop.

A complete fertilizer proved no more effective than ammonium sulphate alone, whereas a mixture of ammonium sulphate and potassium sulphate was less effective than ammonium sulphate alone. Nitrate of soda alone gave poor growth. Moreover, the nitrate was reduced in the submerged soils to nitrites, which are poisonous to rice. Very little nitrification took place in the submerged soils; ammonification, however, went on, not so vigorously as in aerated soils, but sufficiently to supply the nitrogen needs of the rice, provided sufficient organic matter was present.

Conditions favoring aeration are not considered desirable because nitrification sets in immediately after such conditions are produced and the nitrates thus formed become converted into poisonous nitrites upon resubmergence, or are lost through leaching. A rotation of crops, including the plowing under of a legume, is recommended, but when no rotation is practiced it is better to leave the land unplowed until just before planting the next crop.

Introduction to the soils of California, G. E. BAILEY (*Los Angeles, Cal., 1913, pp. 171, fig. 1*).—This book gives an elementary discussion of agricultural geology, soil forming materials, land forms, processes of soil formation, soil classification and its importance, soil particles, soil moisture, organic matter in soils, subsoils, soil movement, and soil permanency and a description of the soils of California as to their location, origin, and agricultural value, dividing them into clay, adobe, silty clay, silt loams, loams, sandy adobe, fine sandy loams, fine sand, hardpan, and alkali soils.

The composition of the soils of south Texas, G. S. FRAPS (*Texas Sta. Bul. 161, pp. 65*).—This bulletin, the third of a series (*E. S. R., 23, p. 315*), contains a description of the soil types of about 33 counties in the southern portion of Texas, notes on their present agricultural uses and productiveness, and also chemical analyses of a number of samples of these types, together with an interpretation of the results.

Soil, D. J. HISSINK (In *Dr. K. W. Van Gorkom's Oost-Indische Cultures. Amsterdam, 1913, vol. 1, pp. 33-116, figs. 11*).—This work deals with soil formation and composition, physical and chemical properties of soil, and soil biology,

and describes certain of the cultivated soils of Java and Deli and of Sumatra, more especially those of Deli.

The Java sugar cane soils in general contain between 0.5 and 63 per cent of sand and coarse matter and from zero to 45 per cent of fine silt. They are divided into clay, sandy, and gravel soils. The majority of these soils are said to contain more than 0.5 per cent of assimilable lime, although the heavier soils are richer in assimilable lime than the lighter. The total potash content lies between 0.37 and 1.53 per cent, and the phosphoric acid content between 0.01 and 0.27 per cent. It is claimed that sugar soils containing only 0.006 per cent of phosphoric acid yielded a good crop when irrigated with silt-laden water. The productiveness of sugar soils is said to depend largely on the content of nitrogen and organic matter, the soils containing from 0.03 to 0.16 per cent of nitrogen and from 0.7 to 3.5 per cent of organic matter. The organic matter contained from 2 to 7 per cent of nitrogen.

The Java tea soils are of volcanic origin, corresponding to laterite and containing considerable hygroscopic water. For productiveness a high humus content is considered necessary. These soils contained from 2.9 per cent organic matter and 0.12 per cent nitrogen for old worn-out tea soils to 8.1 per cent organic matter and 0.39 per cent nitrogen for very productive tea soils. The organic matter is said to contain about 5 per cent nitrogen. The acid-soluble phosphoric acid content lies between 0.09 and 0.22 per cent, the potassium between 0.03 and 0.10 per cent, and the lime between 0.02 and 0.12 per cent.

The coffee soils contain considerable humus which contains about 5 per cent nitrogen. Although the humus is not acid the soils are said to need lime.

The tobacco soils are largely weathered laterite, containing much coarse material and little plant food, the light sandy soils containing more phosphoric acid, however, than the heavier soils. The Deli tobacco soils are, in the order of their humus content and productivity, black sandy humus, sandy clay chocolate colored, red brown, and red soils. The characteristics of the best tobacco soils are said to be a high content of humus, nitrogen, phosphoric acid, soluble potassium, and soluble basic colloidal aluminum silicates, containing much hygroscopic water, and of such a composition that a hard clay mass is not formed.

Soils, J. C. BRUNNICH (*Ann. Rpt. Dept. Agr. and Stock [Queensland], 1912-13, pp. 53, 54, 58-71*).—Analyses of soil samples which are said to be well distributed over the State of Queensland show the majority of them to be acid. The results of soil moisture determinations indicate "the importance of thorough cultivation for the conservation of moisture in the soil."

Analyses of rocks and limestones indicate that "limestone of high quality exists in the State."

An interesting soil-water question in British Guiana, M. BIRD (*Jour. Indus. and Engin. Chem., 5 (1913), No. 12, pp. 1012, 1013*).—Analyses of soils from sugar estates on the coastal lands of British Guiana which are reported show that these soils are well supplied with plant food but contain a decided excess of magnesia over lime. The drainage waters from these soils show, in some cases, as much as 480 parts of alkali per million of water, and also a large excess of magnesia over lime. There is a large loss of sugar in the case of cane grown on these soils due to the fact that the excess of magnesia in the juice interferes with the crystalization of the sugar. The difficulty was corrected by the liberal application of lime to the soil.

The judgment of soil structure on experimental grounds, BORNEMANN (*Mitt. Deut. Landw. Gesell., 28 (1913), No. 45, pp. 620-623*).—A soil sampling cylinder with a special cutting edge is described, which it is claimed will elimi-

nate the errors in determining the structure and density of a soil which are due to loss of part of the sample, disturbance of the structure, adhesion to the sampler, and errors in determining the depth of sample.

As a means of preparing sections of soils for the study of their structure, the samples were immersed in a melted 3:1 mixture of paraffin and stearin, which was then allowed to harden and thus preserve the original structure intact. Studies of sections of a plowed and scarified moist loam by this method showed the scarified soil to be in much the better physical condition for plant growth.

The study of clay, A. MÜNTZ and H. GAUDECHON (*Compt. Rend. Acad. Sci. [Paris]*, 157 (1913), No. 21, pp. 968-974, fig. 1; *abs. in Rev. Sci. [Paris]*, 51 (1913), II, No. 23, pp. 731, 732; *Jour. Chem. Soc. [London]*, 106 (1914), No. 615, I, pp. 127, 128).—For determining the fineness of clay the authors studied the division of the clay particles in a given time at different heights in a homogeneous suspension. For producing sedimentation they employed gravity and the combined action of gravity and an electrical field. By the use of gravity the larger particles settled more rapidly while by the use of the electrical field the finer particles settled more rapidly.

It is considered possible by these methods to establish a purely artificial classification of clays, indicating for each the quantities deposited from the suspension during an arbitrarily chosen period of time.

Estimation of the lime requirement of soils, J. A. BIZZELL and T. L. LYON (*Jour. Indus. and Engin. Chem.*, 5 (1913), No. 12, pp. 1011, 1012).—A modification of the barium hydroxid and ammonium chlorid method proposed by Albert is described, and tests of the method in comparison with that of Veitch are reported. The proposed method is thought to be more rapid and as accurate as that of Veitch.

On the circulation of sulphur and of chlorin on the earth, and on the importance of this process in the evolution of soils and in the plant world, P. S. KOSSOVICH (*Zhur. Opytn. Agron. (Russ. Jour. Expt. Landw.)*, 14 (1913), No. 3, pp. 181-228; *abs. in Internat. Inst. Agr. [Rome]*, *Mo. Bul. Agr. Intel. and Plant Diseases*, 4 (1913), No. 10, pp. 1522-1526).—The following topics are discussed: Chlorin and sulphur in rocks and soils, atmospheric precipitation, and subsoil waters; the rôle of chlorin and sulphur from atmospheric precipitation in soil evolution; and chlorin and sulphur contents and requirements of plants.

Rocks were found to contain only small quantities of chlorin and sulphur, and soils only small amounts of slightly soluble sulphur which decreased with the depth. Soils rich in humus contained as high as 0.1 per cent of sulphur.

Data collected in European Russia and available data for other countries indicate that the chlorin and sulphur contents of the several atmospheric precipitations vary widely, the chlorin from 0.4 to 71.9 parts per million and the sulphur from 0.28 to 90.2 parts per million, while the yearly averages vary within much narrower limits. The quantities of these elements falling with the precipitation per acre per year varied considerably in the localities examined, the chlorin in most territories being between 8.92 and 22.30 lbs. per acre, and the sulphur between 8.92 lbs. in the country and 72 lbs. per acre in the neighborhood of towns and industrial works, where the greatest portion falls in winter. The chlorin content of the atmospheric precipitation increased as the locality approached the seas and oceans or bordered on salt lands, and slight precipitations generally contained more chlorin than the heavier ones.

Theoretical considerations led to the conclusion that soil and subsoil water contains more chlorin and sulphur than atmospheric precipitation due to the evaporation of the latter, and that the relative chlorin and sulphur contents

of soil and subsoil water vary in the same wide limits as the ratio between atmospheric water that penetrates into the soil and that which evaporates. The content of these elements in the subsoil water is said to vary with the locality, from season to season and from year to year.

The continuous introduction of sulphur from the atmosphere is considered a necessary condition for vegetation and soil evolution, on account of the rapid impoverishment of the soil in sulphur by weathering and leaching. In soils and subsoils in which no underground water is formed the accumulation of sulphur and chlorin compounds due to atmospheric precipitation will, in a brief period, from a geological view-point render a soil too saline for most cultivated crops. On the other hand, the formation of a relatively insignificant quantity of subsoil water is sufficient to prevent an accumulation of these compounds.

Compiled analyses are reported to show that the cultivated crops are relatively rich in sulphur, which, expressed as SO_2 and referred to air-dry matter, ranges in the grain of cereals from 0.29 to 0.45 per cent, and in straw 0.26 to 0.55 per cent, while clover hay contains 0.41, lucern hay 0.50, peas 0.45, beans 0.58, soy beans 0.85, turnips 1.85, and cabbage 2.05 per cent.

It is concluded that in certain cases an impoverishment of the soil as to sulphur is possible, and, consequently, that sometimes for a succession of heavy crops the application of fertilizers containing sulphur becomes necessary. Apparently, the circulation of chlorin consists chiefly in a mechanical transport between the land, the seas, and the atmosphere, while the circulation of sulphur is much more complicated; on the one hand, passing continuously from inorganic to organic form and vice versa, and on the other hand, undergoing oxidation and reduction, largely by bacterial activity.

The occurrence of arsenic in soils, J. E. GREAVES (*Biochem. Bul.*, 2 (1913), No. 8, pp. 519–523).—From a study of the arsenic content of many western orchard soils the author concludes that “some virgin soils contain arsenic in appreciable quantities which comes from the decay of the native rocks. Many cultivated orchard soils contain it in large proportions, but there is no uniform relationship between the total quantity of arsenic in different soils and the water-soluble arsenic of these soils. A soil containing over 100 parts per million of total arsenic contained much less water-soluble arsenic than did a soil carrying only 5 parts per million of total arsenic. The solubility of the arsenic found in a soil is governed largely by the salts in the soil and the form in which the arsenic is applied.

“Different portions of the same soil, to which equivalent quantities of various so-called insoluble arsenical compounds had been added, showed great dissimilarities in water-soluble arsenic content. The portion to which Paris green was added contained four times as much water-soluble arsenic as did a portion of the same soil to which an equivalent quantity of lead arsenate had been applied. Arsenic trisulphid, when first applied to soil, is less soluble than lead arsenate, but as time progresses, at least in some soils, the arsenic trisulphid becomes more soluble. For this reason lead arsenate is probably safer than any of the other arsenical insecticides.”

The influence of arsenic upon the biological transformation of nitrogen in soils, J. E. GREAVES (*Biochem. Bul.*, 3 (1913), No. 9, pp. 2–16; *abs. in Jour. Chem. Soc. [London]*, 106 (1914), No. 616, I, p. 237).—Experiments were conducted to determine the effects of different amounts of sodium arsenate, zinc arsenite, lead arsenate, arsenic trisulphid, and Paris green on the ammonification and nitrification of dried blood in a sandy loam soil rich in calcium and iron, and abundantly supplied with plant food with the exception of nitrogen,

The results varied with the different compounds, but all exerted a stimulating effect in the lower concentrations and a toxic action in the higher. "Measured in terms of their influence upon ammonification and nitrification as it takes place in soil, the toxicity of lead arsenate is the least. Next come zinc arsenite and arsenic trisulphid. The greatest toxicity is exerted by Paris green." The stimulation was greatest with lead arsenate and least with Paris green.

It is concluded in general that water-soluble arsenic may exist in such soils "to the extent of 82 parts per million without entirely stopping ammonification and nitrification. Large quantities of ammonia and nitric nitrogen may be produced in a soil containing 50 parts per million of water-soluble arsenic." It is thought improbable that lead arsenate, zinc arsenite, or arsenic trisulphid "will ever be applied to agricultural soil in quantities sufficient to become injurious to soil bacteria. Paris green may, but the quantity added would have to be large."

Some factors influencing ammonification and nitrification in soils.—I, Influence of arsenic, J. E. GREAVES (*Centbl. Bakt. [etc.]*, 2. Abt., 39 (1913), No. 20-22, pp. 542-560; *abs. in Jour. Chem. Soc. [London]*, 106 (1914), No. 616, I, pp. 236, 237).—The work described in this article has been noted from other sources above.

Cupric treatments and the nitrification of the soil, G. PATUREL (*Prog. Agr. et Vit. (Ed. l'Est-Centre)*, 34 (1913), No. 23, pp. 711-714; *abs. in Internat. Inst. Agr. [Rome]*, Mo. Bul. Agr. Intel. and Plant Diseases, 4 (1913), No. 8, pp. 1187, 1188).—A study was made of the rate of nitrification in soils of vineyards which had been sprayed with varying amounts of copper salts for the prevention of disease.

The general conclusion was that there is no reason to apprehend injurious results as regards nitrification from the frequent use of such copper sprays. Even in soils containing over 2 per cent of copper salts the nitric nitrogen was still 60 per cent of that in untreated soil, and with 0.1 per cent of copper sulphate the nitric nitrogen rose to 90 per cent of that in untreated soil. Copper salts added to the soil were rapidly converted into insoluble form, and for this reason exerted only a weak inhibitive action on nitrification even when large quantities were used.

Nitrification in acid humus soils, A. PETIT (*Ann. Sci. Agron.*, 4. ser., 2 (1913), II, No. 4, pp. 397, 398).—The author reports finding pronounced evidences of nitrification in a decidedly acid forest soil deficient in lime.

The relation between decomposition of cellulose and the nitrogen economy of nature, II, H. PRINGSHEIM (*Mitt. Deut. Landw. Gesell.*, 28 (1913), No. 20, pp. 295, 296).—This is a second paper on this subject (E. S. R., 28, p. 720), and deals briefly with aerobic and anaerobic nitrogen-fixing bacteria, nitrogen fixation in the presence of nitrates, nitrogen loss and gain with thermophile bacteria, and notes on pure cultures of cellulose bacteria.

Nitrogen accumulation in continuous rye culture, P. EHRENBURG (*Fühling's Landw. Ztg.*, 62 (1913), No. 13, pp. 450-462).—The author calls attention to a field which is said to have produced a slightly increasing crop of rye for many years, with little or no nitrogen fertilization. He explains this on the ground that the nitrogen required for the rye crop was absorbed as ammonia by the soil from the local rainfall, which is said to contain quantities of ammonia combinations, originating from the combustion of large amounts of poor grade coal in the neighborhood.

Nitrogen accumulation in continuous rye culture, F. LÖHNIS (*Fühling's Landw. Ztg.*, 63 (1913), No. 23, pp. 838-841).—The author questions whether the

conclusion of Ehrenberg (see above) regarding the accumulation of nitrogen in the soil from atmospheric sources is warranted.

Ammonia evaporation from soil, O. LEMMERMANN and L. FRESSENIUS (*Landw. Jahrb.*, 45 (1913), No. 1, pp. 127-154; *abs. in Ztschr. Angew. Chem.*, 27 (1914), No. 17, *Referatenteil*, p. 154).—Tests of 6 soils, including sandy loam and moor soils, were made to determine the influence of the addition of calcium carbonate on the ammonia absorbing power of the soils. The soils were treated with different amounts of ammonium carbonate and submitted to aeration under various conditions.

Each soil was found to have an individual action regarding the absorption of ammonia, and the effect of calcium carbonate varied with the physical and chemical character of the soils, promoting ammonia evaporation in some, retarding it in others, and in one soil having no effect. In three of the soils it was found that with a large application of ammonium carbonate the absorption of ammonia was promoted by the addition of calcium carbonate, while with a small application it was retarded.

It is concluded that the absorption of ammonia salts depends almost entirely on the exchange of bases of the zeolitic combinations in the soil. This is either promoted, retarded, or not at all affected by the addition of calcium carbonate, according to the chemical character of the soil, and that the effect of calcium carbonate is influenced by the absolute quantity of ammonium carbonate added and by the amount of exchangeable potassium present.

The catalytic power of agricultural soil, H. KAPPEN (*Fühling's Landw. Ztg.*, 62 (1913), No. 11, pp. 377-392).—The author reviews a number of investigations on the catalytic power of soils.

Sterilization by heat and by poisonous substances so as to change the physical and chemical composition of soils was found to reduce greatly the rate of decomposition of hydrogen peroxid, while sterilization in which the physical and chemical composition remained unchanged produced no change in the rate of decomposition. A comparison of the rate of decomposition of compounds, when treated with colloidal substances and with samples of cultivated soils in their natural state, showed a marked similarity. The general conclusion is that although the decomposition of matter in soils is promoted by enzymes and bacterial activity, the real catalytic power of soils is due to the colloids, which through the agencies of physical adsorption of substances on their surfaces and an intermediary reaction, have the power of decomposing these substances without losing their own identity.

It is further concluded that the catalytic power of a soil depends largely on its good physical condition and its alkalinity, and that these factors govern the relations between catalytic power and productiveness of a soil.

The food and habits of life of earthworms in relation to agriculture, E. KEUP (*Mitt. Deut. Landw. Gesell.*, 28 (1913), Nos. 39, pp. 538-542; 40, pp. 552-555; 41, pp. 566-570).—In a review of numerous investigations on the life and activity of earthworms in their relations to agriculture, the author briefly describes the anatomical structure of these animals, their habits, and actions, and sums up their beneficial effect on soils as regards fertility as follows: They prevent the formation of peat bogs and swamps, especially in forests, by destroying the plant residue on the soil surface. Through the taking up and digesting of soil constituents the percentage of fine matter is increased, upper and lower soils are intimately mixed together and with plant food, the soil is loosened and crumbled, bacterial action is favored, the soil is fortified against drought, deep rooting is promoted, plant food is placed in more readily assimilable condition, and in short, the soil is put in better physical and chemical condition for plant growth.

The only injurious effects which are attributed to earthworms are said to be an insignificant danger to ungerminated seeds and a slight injury to potato roots and potted plants.

Soil fatigue, F. T. PERITURIN (*Izv. Moskov. Selsk. Khoz. Inst. (Ann. Inst. Agron. Moscou)*, 19 (1913), No. 4, pp. 1-141, figs. 36).—The author briefly reviews the literature on the subject of tired soils and reports a series of cereal cropping experiments conducted to determine the origin of injurious substances said by American investigators to originate in the soil and cause fatigue.

Three successive growths of oats in distilled water, each of two weeks' duration, showed no difference in weight or external appearance.

Several different kinds of plants were seeded in varying alternations in sand cultures, using clean quartz sand and Hellriegel's nutritive solution. The second seeding in all cases produced a weak growth of poor appearance. Repeated seeding in the same pot brought out abnormal characteristics in all the plants, and plants of the second seeding showed the same poor development when following a first seeding of their own kind as when alternated with plants of different botanical groups. The addition of 15 gm. of clean pulverized charcoal to a pot after the first seeding was followed by normal development of the second seeding. The decrease in yield in the second seeding is attributed in part to the action of the decomposing root residue from the first seeding, and not wholly to the alkalinity of the culture medium.

Growth of wheat and oats from the second of two successive seedings in soil, each grown for six weeks, developed abnormally with greatly decreased yield. Complete fertilization of the soil between seedings decreased the abnormal development very little.

Oats and buckwheat were grown in water cultures, using soil extracts to which the Hellriegel nutritive solution was added. Part of the solutions was used in its original state, part was filtered through charcoal, and part was boiled. The filtered solutions produced normal growths, while the boiled solutions produced both normal and abnormal growths, depending on the solution. The untreated solutions in which there had been no previous growth produced a normal growth.

It is concluded that extracts from soils cropped as indicated probably contain substances injurious to plants which are removed by filtration through charcoal, and that boiling destroys them only in certain soils. No injurious substances were found in soils which had not been cropped with cereals, and it is thought probable that these soil extracts are injurious to plant growth in general.

The Illinois system of permanent fertility, C. G. HOPKINS (*Pop. Sci. Mo.*, 84 (1914), No. 1, pp. 52-63, figs. 5).—In this system "those materials which are naturally contained in the soil in inexhaustible amounts are liberated from the soil and thus made available for crop production; those contained in the air are likewise drawn upon as needed; while those materials which must be purchased are bought and applied in liberal quantities, but in low-priced forms, and then made available on the farm by economic natural methods."

The system involves liberal applications of barnyard manure, ground limestone, and raw rock phosphate, and rotations including a legume to supply nitrogen. The practically inexhaustible supply of potash in the soil is drawn upon to furnish the necessary amounts of this element of plant food. The successful application of the system on a farm of poor gray prairie soil in southern Illinois is described. See also a previous note (*E. S. R.*, 29, p. 623).

Comparative tests of various fertilizers, G. SMETS and E. THOMAS (*Abd. in Zentbl. Agr. Chem.*, 42 (1913), No. 10, pp. 667-669).—Pot tests on corn of

Thomas slag and calcined raw phosphate, phonolite and potassium chlorid, and sodium nitrate, ammonium sulphate, and calcium cyanamid are reported.

The calcined raw phosphate and the phonolite were almost without fertilizing effect. The ammonium sulphate was four-fifths, the cyanamid three-fifths as effective as sodium nitrate.

Experiments with fertilizers in West Prussia, GERLACH (*Mitt. Kaiser Wilhelms Inst. Landw. Bromberg*, 5 (1913), No. 5, pp. 335-359).—A number of experiments with a variety of crops on soils of different kinds throughout the Province of West Prussia are briefly reported.

Summarizing the general results for several years it is stated that fertilizers as a rule proved beneficial. Nitrogenous fertilizers were especially effective, but the results also indicated that available potash is lacking in most of the soils.

The use of preservatives with liquid manure rich in nitrogen, D. MEYER (*Illus. Landw. Ztg.*, 33 (1913), No. 91, pp. 823-825).—Four cc. of liquid manure containing 0.778 per cent ($=0.03112$ gm. per flask or 26.8 lbs. per acre) of nitrogen was added to 225 gm. of dry ($=250$ gm. of moist) soil, air was drawn through the flask, and the ammonia so removed was collected in dilute sulphuric acid and titrated.

It was found that the loss of nitrogen was much greater with sandy soils than with loam soils and with dry soils than with moist. With dry sandy soils the loss of nitrogen was 21.95 per cent of that in the manure in the first 48 hours, with moist sandy soil 10.58 per cent, with dry loam soil 11.33 per cent, and with moist loam soil 5.33 per cent. In 48 hours more the loss with moist sandy soil was increased to 18.14 per cent, with moist loam soil to 8.71 per cent.

One hundred cc. samples of the liquid manure were treated with varying amounts of sulphuric acid, phosphoric acid, superphosphate, and gypsum. From 92.8 to 95.9 per cent of the nitrogen of the manure was in form of ammonium carbonate. The sulphuric acid was applied in amounts varying from a little less to a little more than enough to fix the total nitrogen or replace the carbon dioxid present. The liquid was allowed to evaporate slowly to dryness at ordinary temperature. Without treatment there was almost complete loss of the ammoniacal nitrogen. With addition of sulphuric acid equivalent to the total nitrogen there was a loss of 7.27 per cent and with sulphuric acid equivalent to the carbon dioxid only 2.68 per cent. Increasing the acid beyond the equivalents stated reduced the loss still further but not materially. The losses were much greater with phosphoric acid, superphosphate, and gypsum than with sulphuric acid. Over 50 per cent of the nitrogen was lost in case of gypsum. It was about 37 per cent with the largest amount of phosphoric acid used and 27 per cent with the largest amount of superphosphate used.

The use of sulphuric acid is considered the most effective and satisfactory means of preservation.

The industrial synthesis of nitric acid and ammonia, C. MATIGNON (*Rev. Gén. Chim.*, 16 (1913), Nos. 21, pp. 357-365; 22, pp. 381-388).—The progress in devising and perfecting processes for this purpose is reviewed, and the future possibilities of the industry are discussed.

Mustard and buckwheat fertilized with various raw phosphates, P. E. GAL'TSEV and I. V. IAKUSHKIN (*Izv. Moskov. Selsk. Khoz. Inst. (Ann. Inst. Agron. Moscou)*, 19 (1913), No. 1, pp. 193-204, figs. 2; *Iz Rezul't. Veget. Opytov Lab. Rabot*, 8 (1911-12 [pub. 1913]), pp. 193-204, figs. 2).—The action of the various phosphates (Russian) on mustard and buckwheat was compared with the results of previous tests with lupines. The results varied with the different phosphates but there was a certain parallelism between the results with lupines and buckwheat.

Assimilation of reverted phosphoric acid by plants, V. P. KOCHETKOV (*Izv. Moskov. Selsk. Khoz. Inst. (Ann. Inst. Agron. Moscou)*, 19 (1913), No. 1, pp. 205-222, figs. 9; *Iz Rezul't. Veget. Opytov Lab. Rabot*, 8 (1911-12 [pub. 1913]), pp. 205-222, figs. 7).—The results of sand cultures with various phosphates untreated, leached with water, and digested with ammonium citrate were variable and inconclusive.

The German potash salts, LEBERKE (*Pflanzer*, 9 (1913), No. 11, pp. 533-542, pls. 8).—This article discusses the character and extent of the German potash deposits, method of exploitation, manufacture, and use, including statistics of home and German colonial consumption and foreign export.

Comparative fertilizer tests of common salt and potash salt, P. BOLIN (*Meddel. Centralanst. Försöksv. Jordbruksområdet*, 1913, No. 82, pp. 16; *abs. in Zentbl. Agr. Chem.*, 42 (1913), No. 10, pp. 670-673; *Jour. Soc. Chem. Indus.*, 32 (1913), No. 23, p. 1122).—The results of 19 series of comparative tests in different parts of Sweden of equal amounts of sodium chlorid and 37 per cent potash salt applied to oats, hay, kohl-rabi, sugar beets, and fodder beets are reported.

On hay and on oats on moor soils the sodium chlorid was but little less effective in increasing the yield than the potash salt. With kohl-rabi and beets 428 lbs. per acre of salt produced a greater and more profitable increase in yield than 178 lbs. of potash salt. The results are attributed more to the chlorin or general effect of the salts than to the supply of either potash or soda.

Fertilizers, R. E. ROSE and L. HEIMBURGER (*Fla. Quart. Bul. Agr. Dept.*, 23 (1913), No. 3, pp. 187-199, 204-209).—An account is given of the fertilizer inspection during 1913, including analyses of fertilizers examined, with notes on laws and regulations and valuation of fertilizers.

Report of analyses of commercial fertilizers (*Louisiana Stas. Fert. Rpt. 1912-13*, pp. 102).—Analyses of 9,230 samples of fertilizers and fertilizing materials inspected during the season of 1912-13 are reported.

Fertilizer analyses, A. J. PATTEN, W. C. MARTI, A. K. HART, and O. F. JENSEN (*Michigan Sta. Bul.* 272, pp. 3-55).—This is a report of the usual kind, giving results of analyses and valuations of fertilizers inspected in Michigan in 1913. The text of the State fertilizer law as amended in 1913 is also given.

The amended law defines the term "commercial fertilizer," including specifically limestone or lime rock. It also more clearly prescribes the form and contents of the certificate of analysis, etc., to be filed with the secretary of state and attached to the bags or packages of fertilizers.

Analyses of commercial fertilizers, B. L. HARTWELL ET AL. (*Rhode Island Sta. Insp. Buls.*, 1911, Sept., pp. 11; Oct., pp. 8).—Analyses and valuations of fertilizers inspected during the latter part of 1911 are reported.

Commercial fertilizers in 1912-13, G. S. FRAPS (*Texas Sta. Bul.* 160, pp. 5-33, figs. 2).—Analyses and valuations of fertilizers inspected during the season of 1912-13 are reported, with collateral information regarding fertilizers and fertilizer inspection, and a list of registered brands is given. The consumption of fertilizers in the State during the period covered by the inspection is estimated to have been 75,500 tons.

AGRICULTURAL BOTANY.

Applied botany for the colonies, M. DUBARD (*Botanique Coloniale Appliquée. Paris*, 1913, pp. VI+347, figs. 146).—In this book the author has departed from the usual arrangement of the material, and instead of describing plants according to their systematic sequence he has grouped them with reference to their

more important products, thus bringing together plants of widely divergent botanical relationships that are closely allied so far as their uses are concerned.

After giving general directions for the preparation and care of material for study, the author gives chapters on the microscopic studies of the principal substances found in plant cells, plant structures, etc. The principal proportion of the book is taken up with studies on starches, tropical woods, their character and uses, fibers, and secretory substances such as resins, rubbers, etc.

Biology of plants, F. W. NEGER (*Biologie der Pflanzen auf experimenteller Grundlage. Stuttgart, 1913, pp. XXIX+775, figs. 315*).—The author discusses at considerable length the theory of adaptation, and treats of adaptation of plants to light, temperature, water, mechanical stimuli, edaphic adaptations, symbiotism, special adaptations for propagation, etc., the subject being largely presented in such a manner that the book should be of special interest to students of ecology.

Researches on irritability of plants, J. C. BOSE (*London, New York, and Bombay, 1913, pp. XXIV+376, figs. 190*).—The author presents the results of his investigations on the irritability of plants, using new electrical devices for recording that are considered superior to the methods formerly applied.

The two forms of apparatus are called the oscillating recorder and the resonant recorder. In the former the recording surface is so oscillated as to bring it in contact with the recording point. In the second the writing point is made to vibrate at required frequencies, making an intermittent contact with the recording plate. Both when tested gave satisfactory records of response to stimuli of various sorts.

The author claims from a survey of the response of living tissues that there is hardly any phenomenon of irritability observed in the animal which is not also found in the plant, and that various manifestations of irritability in the plant have been shown to be identical with those in the animal.

Chemical and physical changes in geotropic stimulation and response, EVA O. SCHLEY (*Bot. Gaz., 56 (1913), No. 6, pp. 480-489, figs. 6*).—In view of the effect of acidity on the absorption of water and on the growth rate, the author made a study of the concave and convex halves of geotropically stimulated and responding organs for difference in acidity, and incidentally for other features, such as the sugar content.

It was found that the acidity of the growing shoot is greatest at the tip and decreases downward. The relative acidity of the two flanks of the geotropically stimulated shoots changes during presentation and reaction time. The increase of acidity does not parallel the relative rate of growth on the two flanks. Several plants examined were found to develop in neutral solution a chromogen which acted as a delicate acid-alkali indicator. The percentage of dry weight was found to be greatest on the concave side of the stimulated organs.

Acidity, gaseous interchange, and respiration of cacti, H. M. RICHARDS (*Carnegie Inst. Washington Year Book, 11 (1912), pp. 65, 66*).—An investigation has been made of the respiration of cacti and the phenomena related thereto under various external conditions. The effects of temperature changes and wound reaction were studied, and parallel with these experiments a series of experiments were conducted to determine the respiratory quotient of cacti.

In general it was found that the respiration of the young joints is far higher than that of the older but turgid tissue, while that of the latter greatly exceeds the respiration of the mature but inactive plant. The gas interchange was found to be different in the young and old shoots. The younger ones approximated more nearly the usual absorption of oxygen and evolution of carbon dioxide, while the older joints showed a larger use of oxygen, which is said

to be characteristic of succulent plants. The acidity of plants was found to increase in the absence of oxygen and to decrease with an increased supply in the atmosphere. The experiments showed conclusively that the diminishing acidity from early morning to late in the afternoon is a combined temperature and light reaction.

Influence of light and of shade on shoots of woody plants, H. FARENHOLTZ (*Bot. Centbl., Beihefte, 31 (1913), 1. Abt., No. 1, pp. 90-118*).—Giving results of a study of light as influencing development of branches and seedlings of beech, elm, and other forest trees, the author states that the anatomical structure of the branches is altered in several respects under the influence of different illuminations. A number of differences of anatomical response are noted between the effect on long and that on short branches in this respect, while comparatively small differences appear in twigs of the seedlings. The latter are said to show, when grown in light, similarities to shade grown branches of older plants of the same kind. Beech buds grown in sunshine are said to show peculiarities as regards number, size, and internal structure, as compared with those produced in shade.

A bibliography is appended.

Influence of shading on composition of tobacco, A. STUTZER and S. GÖY (*Biochem. Ztschr., 56 (1913), No. 3, pp. 220-229*).—Experiments described with tobacco grown under controlled conditions are claimed to show that a large percentage of nicotin can be produced by abundant sunlight, high temperature, liberal nitrogen manuring, and sparing use of water in the soil; also that direct sunlight favors a high potassium, but a low chlorin, content.

Sensitive life of *Asparagus plumosus*.—A morpho-physiological study, F. C. NEWCOMBE (*Bot. Centbl., Beihefte, 31 (1913), 1. Abt., No. 1, pp. 13-42*).—The author concludes a somewhat detailed summary of results obtained from a study of the various tropisms of *A. plumosus nanus* by stating that the biological significance of various characteristics of this plant when grown in darkness, such as the removal of inhibition of elongation of the aerial shoot, the cessation of twining, the failure to unfold lateral buds, and the absence or stunted growth of needles, may be referred to the conservation of building material. It is thought that the significance of the bending to a horizontal position of the upper portion of the aerial shoot from the rhizome and of the seedling may be that it brings the assimilating part of the plant into a more favorable position with respect to light.

An examination into experiments on the action of atmospheric electricity on plants, P. LESAGE (*Compt. Rend. Acad. Sci. [Paris], 157 (1913), No. 18, pp. 784-787, fig. 1*).—The investigations of Grandeau, who found that plants grown under wire cages and submitted to the influence of atmospheric electricity were retarded in growth, are reviewed. The author grew cress and *Datura* under wire cages, under a cage of silk thread of the same diameter and mesh as the galvanized iron wire used, and in the open.

The experiments with cress did not give any striking results, although the plants grown under both cages were somewhat different from those cultivated in the open. In the case of the *Datura*, the plants of which were grown from July to September, those under both cages were decidedly reduced in size, the ones under the wire cage, however, being slightly better developed than those under the silk cage.

During the progress of these investigations the author examined other phenomena connected with the differences under the cages, and reports that evaporation was greatly reduced under the protection of the cages.

Chemical effects of radiant energy in plant processes, H. A. SPOEHR (*Carnegie Inst. Washington Year Book*, 11 (1912), pp. 63-65).—In continuation of previous studies (E. S. R., 27, p. 521), the author reports on the effect of ultraviolet light on the decomposition of carbon dioxide, etc.

Contrary to the statement of Usher and Priestley (E. S. R., 25, p. 634), carbon dioxide was not reduced to formaldehyde under the action of ultraviolet light. It was found, however, that formaldehyde was formed when a solution of potassium carbonate containing colloidal platinum and through which carbon dioxide was allowed to pass was exposed to ultraviolet light.

A number of plant acids were under observation, having been exposed to sunlight for a year. The products formed by this long insolation are being investigated. It has been found that acetic, glycolic, propionic, malic, tartaric, and citric acids are decomposed in the light with the liberation of considerable quantities of carbon dioxide. Formaldehyde is also formed, and, in the case of the higher hydroxyacids, nonvolatile substances are produced which reduce Fehling's solution. It was found in general that the acids were decomposed much more easily in the form of a salt than as the free acid. Formic acid was not found to yield any reduction product.

Influence of colloids on microbiological processes, N. L. SÖHNGEN (*Centbl. Bakt. [etc.]*, 2. Abt., 38 (1913), No. 21-25, pp. 621-647, figs. 4).—From several series of studies the author concludes that adsorption phenomena are of considerable significance in microbiological processes. Colloidal silicic acid in the Beijerinck culture medium promoted in marked degree the fixation of nitrogen by *Azotobacter*, as did also raw humus and colloidal oxides of iron and aluminum. Alkali salts of humus acids hinder alcoholic fermentation, which, however, is favored by the presence of turf, filter paper, and garden soil. Oxidation of petroleum by bacteria is considerably increased by the addition of colloidal oxides of iron and silica.

The behavior of micro-organisms in brines, G. J. PEIRCE (*Carnegie Inst. Washington Year Book*, 11 (1912), pp. 52, 53).—The author has been observing for three years the micro-organisms occurring in brines of salt works along the shores of San Francisco Bay. The flora was found to vary with the concentration of the brine, but although the brines were rich in organic matter it was impossible to secure an organic analysis. Many of the brine organisms were found to be more or less completely saprophytic, but their relations to the organic constituents of the brines could not be determined.

Alterations in woody tissues and bacterial action in Salton water, M. A. BRANNON (*Carnegie Inst. Washington Year Book*, 11 (1912), pp. 51, 52).—A study was made of stems of mesquite (*Prosopis juliflora*) and creosote bush (*Covillea tridentata*), together with the water occurring in Salton Sea, to determine the cause of certain changes that have been observed.

Chemical analyses of the water did not reveal any free chemical that could injure the plants, but it became evident that the changes were due to bacterial action. Later it was proved that both the reduction of the sulphates and the hydrolysis were due to the action of different groups of bacteria. The agents that hydrolyzed the cell walls were formed by bacteria belonging to the Amylobacter group.

The effects of soluble humates on nitrogen fixation and plant growth, W. B. BOTTOMLEY (*Gard. Chron.*, 3. ser., 54 (1913), No. 1400, pp. 295, 296, figs. 3).—In a lecture delivered before the Horticultural Club the author described pot experiments which seemed to demonstrate that when sterilized peat, saturated with active cultures of nitrogen-fixing organisms, is used to inoculate ordinary soil, nitrogen fixation takes place much more rapidly than where liquid cultures of the organisms are added directly to the soil.

Summarizing the results of his investigations it is said that the addition of sterilized and inoculated peat adds active nitrogen-fixing organisms to the soil under suitable conditions for nitrogen fixation. It stimulates the nitrogen fixers already in the soil, adds direct plant food, promotes root development, and improves the mechanical condition of the soil.

The inulin metabolism of *Cichorium intybus*.—II, Origin and storing of inulin, V. GRAFE and V. VOUE (Biochem. Ztschr., 47 (1912), No. 3-4, pp. 320-330).—Continuing former work (E. S. R., 28, p. 821), the authors report that inulin appears to play an important part in the assimilation of carbon dioxide by chicory, that no difference in content of inulin or sugar as between forenoon and afternoon is noted, and that in the earlier course of root development an increase of inulin is noted in relation to a decrease of reducing sugars.

The inulin metabolism of *Cichorium intybus*, III, V. GRAFE and V. VOUE (Biochem. Ztschr., 56 (1913), No. 3, pp. 249-257).—Summarizing this contribution in connection with previous work (see above), the authors state in addition to former conclusions that inulin dissolved in cell sap also serves as a protection from cold.

The physiological significance of anthocyanin in *Hedera*, F. TOBLER (Festschrift 84. Versamml. Deut. Naturf. u. Ärzte von der Med. Naturw. Gesell. Münster, 1912, pp. 218-221).—The author cites observations of his own on *Hedera*, claimed to show that the capability to form anthocyanin in a plant is related to its degree of adaptation to a cool or cold climate.

Injury to plants by smoke gases and dust, J. HASENBÄUMER (Festschrift 84. Versamml. Deut. Naturf. u. Ärzte von der Med. Naturw. Gesell. Münster, 1912, pp. 123-147).—Comparative figures regarding plants grown in smoke or gases (as from coke works) are cited to show the unfavorable effects thereof on development and content in numerous cases including widely separated species. The part played by wind in this connection is also discussed.

Injury to vegetation near cyanamid works, G. AMPOLA and A. VIVENZA (Ann. R. Staz. Chim. Agr. Sper. Roma, 2. ser., 6 (1913), No. 2, pp. 77-115).—A study of the various degrees of injury to vegetation observed around chemical works near Terni, Italy, is said to show that this is due to dust and vapors given off, in particular sulphur dioxide, which is claimed to be injurious when present in very small proportions.

Concrescences in forest trees, ZAMETZER (Mitt. Bayer. Bot. Gesell., 3 (1913), No. 1, pp. 8, 9, pl. 1; abs. in Bot. Centbl., 122 (1913), No. 20, pp. 468, 469).—Illustrations and descriptions are given of two cases in each of which two vigorous young red beech trees are united into one cylindrical trunk several meters above the ground. This is thought to be the result of abrasion due to wind movements when weighted with snow.

The group origin of species, H. DE VRIES (Gruppenweise Artbildung unter spezieller Berücksichtigung der Gattung *Oenothera*. Berlin, 1913, pp. VIII+365, pls. 22, figs. 121; rev. in Nature [London], 92 (1913), No. 2301, pp. 395, 396).—This book, which is considered an outgrowth and development of the author's mutation theory, marks an important advance in our knowledge of the hereditary behavior of the evening primroses and also coordinates and develops his views on the general subject of heredity and its relation to mutation.

The author adheres to the view that characters which are independently inherited must be represented by separate structures (pangens) in the cell. These are not considered simply present or absent from the cell but may exist under three conditions, active, inactive, and labile.

In addition to the theoretical discussion, he shows that new and constant races frequently result from crossing. Some of these races, however, are not

Mendelian recombinations but possess many characters which have been modified.

The author considers that mutation as a process is not to be confounded with the mere recombinations of unit characters, and that various types of hereditary behavior exist, only occasional characters showing the Mendelian type of segregation.

Note on gametic reduplication in *Pisum*, CAROLINE PILLEW (*Jour. Genetics*, 3 (1913), No. 2, pp. 105, 106).—An account is given of crosses made between a tendrilled variety of peas having wrinkled seed and a round-seeded acacia form, the object of the cross being to see whether among the gametes of F_1 repulsion between the factors, tendrils, and round seed would occur. The F_2 seeds were sorted into round and wrinkled, and the result showed that repulsion occurred. It is considered to be presumably only partial, but the proof is thought to be beyond the scope of practical experiment on account of the large number of plants involved.

In view of the possibility that factors other than roundness might couple with the factor for tendril, crosses were made in which various factors were introduced with the tendril and acacia characters, but no signs of coupling or repulsion were observed in F_2 from such crosses.

A quantitative study of the factors influencing the weight of the bean seed.—I, Intra-ovarial correlations, J. A. HARRIS (*Bot. Centbl., Beihefte*, 31 (1913), 1. Abt., No. 1, pp. 1-12, pls. 4).—This paper, the first of a series dealing with the physiology of seed production, gives data regarding the characteristics of the pod and the weight of the bean seed.

It is stated that the correlation between such weight and the number of ovules per pod is so low as to be practically negligible. That between number of seeds matured per pod and seed weight is low but decided, being always negative. The chances for an ovule to develop into a seed are generally greater toward the stigmatic end. The weight of the seed shows the same general kind of correlation, but this finally becomes less marked as the distal end is approached.

The cultural bud mutations of tuberous *Solanums*, E. HECKEL (*Rev. Sci. [Paris]*, 51 (1913), II, No. 19, pp. 577-582).—The author describes the work which has been done in inducing what he calls bud mutations in tuberous *Solanums*, and interprets the results obtained in relation to the criticism that such transformations are not true mutations.

On the presence of connecting threads in graft hybrids, MARGARET HUME (*New Phytol.*, 12 (1913), No. 6, pp. 216-221, fig. 1).—A study was made of the graft hybrids *Cytisus adami*, *Solanum tubingenense*, and *S. kœlreuterianum* with a view to determining the presence of connecting threads between the different elements.

From the experiments the author draws the conclusion that if Baur's hypothesis that graft hybrids really are periclinal chimeras is true, and there is every reason to believe that it is, there is no doubt that genetically unrelated tissues can be joined by connecting threads. The threads arise secondarily, since it is supposed that the naked cytoplasm of the two components does not come into contact.

Anatomy as a means of diagnosis of spontaneous plant hybrids, R. HOLDEN (*Science, n. ser.*, 38 (1913), No. 991, pp. 932, 933).—From a study of forms of *Betula pumila* from the Arnold Arboretum and of a variety of *Equisetum*, the author is led to the conclusion that spontaneous hybrids are of common occurrence and that they can be clearly diagnosed as hybrids by an investigation of their vegetative and reproductive internal anatomy. It is believed that an in-

vestigation of the anatomy of recognized or cryptohybrids is likely to be of great value from the genetical standpoint and will in all probability lay bare the real foundation of the so-called mutation hypothesis of De Vries.

Mistletoe infection in relation to classification, C. VON TUBEUF (*Centbl. Bakt. [etc.]*, 2. Abt., 36 (1913), No. 19-25, pp. 508-531, pl. 1; *abs. in Ztschr. Landw. Versuchsw. Österr.*, 16 (1913), No. 4, p. 477).—The results are given in detail and in tabular form of infection experiments made with several species of mistletoe on numerous hosts differing widely in relationship. See also a previous note (E. S. R., 29, p. 243).

FIELD CROPS.

Agriculture in Abyssinia.—I, Soils and crops, A. KOSTLAN (*Tropenpflanzer, Beihefte*, 14 (1913), No. 3, pp. VII+183-250, figs. 31).—This publication gives an account of aboriginal methods and customs of agricultural practice in Abyssinia under the headings of climate, soil, implements, fertilizers, irrigation, seeds, seed selection and care, cultivation of cereals, legumes, oil-producing plants, root crops, tobacco, coffee, *Rhamnus prinoides*, *Catha edulis*, fiber plants, sugar-producing plants, vegetables, and fruits. A bibliography is appended.

Experiments with wheat, oats, and barley in South Dakota, M. CHAMPLIN (*U. S. Dept. Agr. Bul.* 39, pp. 37, pl. 1, figs. 11).—This bulletin discusses two essential requirements for crop improvement, viz, better varieties and better seed, and presents the results of studies pertaining thereto in regard to wheat, oats, and barley as experimented with at Eureka, Highmore, Cottonwood, and Brookings, in cooperation with the South Dakota Experiment Station.

Descriptions of the leading varieties of each kind of cereal and of cultural methods are given. Analyses on the composition showed the protein content of the several varieties of wheat to range from 17.69 to 21 per cent, of oats from 14.63 to 18.56, and of barley (6 rowed) from 16.7 to 18.8 and (2 rowed) from 16.7 to 19.7 per cent.

From the results of these experiments, which have been carried on since 1903 and include variety tests, the following varieties are recommended for cultivation in that State: (1) Wheat: Kubanka durum (C. I. No. 1440), Haynes Blue Stem (Minn. No. 169), Red Fife (C. I. No. 3081), and Fife (Minn. No. 163). (2) Oats: Swedish Select (C. I. No. 134) and Sixty-Day (C. I. No. 165). (3) Barley: (a) For the eastern district: Manchuria (Minn. No. 105) and Odessa (C. I. No. 182). (b) For the central district: Hannchen (C. I. No. 531). (c) For the western district: Gatami (C. I. No. 575), Mariout (C. I. No. 261), and related varieties.

[Annual report of the divisions of agronomy and fiber] (*Philippine Agr. Rev. [English Ed.]*, 5 (1912), No. 13, pp. XXI-XXIV, XXXVII-XLVI).—These pages contain brief notes on the work in progress with rice, Rhodes grass, Guinea grass, Japanese cane, sorghum, cowpeas, abaca, maguey, sisal, kapok, and cotton during the year.

Report of government agriculturist and botanist, H. G. MUNDY (*South. Rhodesia Rpt. Dir. Agr.*, 1911, pp. 30-38).—This report gives brief notes on trials of alfalfa, castor beans, cassava, sugar cane, Napier's fodder, hemp, sisal, cotton, flax, ramie, rescue grass, sainfoin, cowgrass clover (*Trifolium perenne*), sulla, tall oat grass, Yorkshire fog (*Holcus lanatus*), perennial rye grass, Paspalum, sheep's burnet (*Sanguisorba minor*), sheep's parsley (*Petroselinum sativum*), cocksfoot, awnless brome, Toowomba canary grass (*Phalaris bulbosa*), Egyptian clover, Florida beggar weed, arrowroot, soy beans, pota-

toes, linseed, peanuts, dry-land rice, maize, oats, wheat, stock melon, Boer manna, teff grass, velvet beans, Kafir beans, root crops, chicory, and buckwheat.

Report of the agriculturist and botanist, H. G. MUNDY (*South. Rhodesia Rpt. Dir. Agr., 1912, pp. 33-40*).—This report gives notes on a continuation of work mentioned above with additional data on barley, monkey nuts, and rye.

The breeding work at Svalöf, C. FRUWIRTH (*Monatsh. Landw., 6 (1913), No. 7, pp. 193-207*).—This paper describes the work in plant breeding that is being done at this Swedish station, and discusses some results and the principles involved.

Experiments in dry farming (*Agr. Jour. Union So. Africa, 5 (1913), No. 6, pp. 925-930*).—Here are given in tabular form data on results of growing the following crops in 1912 at the dry-land station at Lichtenburg: Soy beans, potatoes, maize, teff grass, flax, peas, millet, sunflower, cowpeas, vetch, lupines, velvet beans, Kafir beans, barley, wheat, rye, peanuts, alfalfa, sainfoin, *Phalaris bulbosa*, cotton, coriander, ginger, clovers, beggar weed, *Bromus inermis*, forest trees, apples, and Spanish reeds.

Dry land pastures (*Rhodesia Agr. Jour., 10 (1912), No. 2, pp. 244-246*).—This article mentions as desirable *Paspalum dilatatum* as a summer pasture grass, and *Phalaris bulbosa* as a winter pasture grass, both having given good results on dry lands in Rhodesia.

On the appropriation of nitrogen by legumes, A. HERKE (*Kísérlet. Közlem., 15 (1912), No. 5, pp. 790-800*).—Through his experiments the author concludes that when the soil contains sufficient assimilable nitrogen the presence of nodules on the roots has no influence on the nitrogen content of lupines. When the soil is poor in nitrogen the presence of nodules increases the absolute as well as the percentage of nitrogen content of the plant. It is noted that the greater the percentage of nodules to plant, by weight, the greater is the percentage of nitrogen in the plant (with nodules removed), but when the percentage of nodules becomes large the nitrogen content of the plant does not increase by further growth of the nodules. It was also determined that the dry matter, the nodule growth, and the nitrogen content of the plant may continue to increase after the flowering stage. The percentage of nitrogen in this dry matter of the nodules varied from 5 to 7 per cent, and 57.43 per cent of this nitrogen was soluble in water.

The action of sulphur as a fertilizer, M. A. DEMOLON (*Sta. Agron. Aisne Bul., 1912, pp. 33-41*).—Results of experiments are given in which flowers of sulphur at the rate of 10 gm. per square meter increased the yield of rutabagas, parsnips, and beets. The applications of sulphur to the soil seemed to give rise to slightly increased quantities of sulphate. Sulphur applications at the rate of 100 kg. per hectare (89 lbs. per acre) increased the yields of potatoes, but not of carrots.

The cultivation of cereals with the aid of new appliances and by new methods, C. KLAUS (*Landw. Hefte, 1913, No. 22, pp. 48, figs. 5*).—The author describes and discusses the use of recently introduced machines and appliances for securing the most perfect seed bed, as well as methods of hilling, drilling, and seeding in furrows. Some results of recent experimental work are quoted in discussing the practicability of these methods.

[Alfalfa production] (*Ann. Rpt. Ill. Farmers' Inst., 17 (1912), pp. 173-205, 348-353, figs. 2*).—In this article A. P. Grout, G. F. Tullock, and others relate their experiences in producing alfalfa in various parts of Illinois and on several soil types, ranging from heavy rich bottom and drained lands to the light, poor soils of the State. Two papers are included, The Value of Alfalfa on Average Illinois Farms, by A. N. Abbott, and How To Secure a 95 per cent Perfect Stand of Corn, by F. I. Mann.

A drought-resisting adaptation in seedlings of Hopi maize, G. N. COLLINS (*U. S. Dept. Agr., Jour. Agr. Research*, 1 (1914), No. 4, pp. 293-302, pls. 4, figs. 2).—This paper discusses the morphology of the maize seedling and ascribes the value of the Hopi variety as a drought-resistant crop to the fact of the elongation of the mesocotyl.

In laboratory studies it was found that Navajo maize seedling appeared at the surface when the seed was planted to a depth of 32 cm. (12.5 in.) or less, Boone County White planted at the depth of 20 cm. or less, and Chinese maize at 10 cm. or less. In the field it was found that the Indians in New Mexico and Arizona had often planted to a depth of 25 cm.

"A study of the varieties grown by the Hopis and other agricultural Indians shows that these varieties possess two special adaptations: (1) A greatly elongated mesocotyl that permits deep planting, and (2) the development of a single large radicle that rapidly descends to the moist subsoil and supplies water during the critical seedling stage."

A bibliography is appended.

Influence of distance of planting on the yield and nutritive value of fodder corn, J. WEISER and A. ZAITSCHEK (*Kisérlet. Közlem.*, 15 (1912), No. 4, pp. 543-617, fig. 1).—A thin stand yielded somewhat more protein and fat than close planted corn. The digestibility seemed to be about the same in both cases. In a wet season the close planted corn gave the higher yield, while in a dry season the reverse was true. In a fermentation test the fodder from the thin stand suffered greater loss than the thick stand product. Late cutting of the thin stand caused greater difficulty in preparing the stubble for the next crop.

The influence of K-P-N on the growth and production of corn, T. N. VIBAR (*Philippine Agr. and Forester*, 1 (1911), No. 10, pp. 175-187).—The author surveys earlier work in the United States on this subject and gives results of his own investigations. Methods are given of soil preparation, cultivation, and harvesting in regard to the 9 plats. The results showed the fertilizers to rank in the following order: Kainit, basic slag, with tankage of least value, when applied singly; when 2 were combined the order of rank was tankage and basic slag, tankage and kainit, and kainit and basic slag. The combination of the 3 fertilizers gave the greatest increased gain, viz, 475.86 kg. of husked corn per hectare (425 lbs. per acre).

Experimental hybridization of cotton, T. THORNTON (*Dept. Agr. Trinidad and Tobago Bul.* 11 (1912), No. 70, pp. 100-102).—The results obtained by crossing varieties of cotton showed increased yields for the first generation. With this point in view a method is described by which a laborer can readily be trained to pollinate from 300 to 360 plants per day, thus producing hybrid seed for the following season at a slight cost in comparison with the expected increased yield of the succeeding crop.

Distribution of cotton seed in 1914, R. A. OAKLEY (*U. S. Dept. Agr., Distribution of Cotton Seed in 1914*, pp. 16).—This publication announces details as to the distribution of cotton seed by this Department in 1914, includes an introductory statement by O. F. Cook explaining how the seed may be utilized to the best advantage by the farmer, and describes 7 varieties of cotton, giving their origin and adaptation.

Fiber plants, J. BEAUVÉRIE (*Les Textiles Végétaux*, Paris, 1913, pp. XIII+730, figs. 290).—The first of the 3 parts of this book treats of morphological, anatomical, botanical, and physical and chemical characters of fiber plants in general, and of retting, methods of investigations, and classification of fibers. The second and third parts treat of the characteristics, varieties, culture, diseases, and enemies of the fiber, and the retting and uses of each of the following

families of fiber plants: Hemp, ramie, stinging nettle, flax, jute, cotton, more than 10 other Malvaceæ, *Abroma augusta*, kapok, Papilionaceæ, Boraginaceæ, Asclepiadaceæ, Apocynaceæ, *Phormium tenax*, yuccas, aloes, *Sansevieria agave*, sisal, henequin, abaca, *Ananassa sativa*, members of Gramineæ, Cyperaceæ, Typhaceæ, Naladaceæ, and palms.

A bibliography of 676 publications is appended.

On the manuring of mangels, J. PORTER (*Herefordshire County Council Farmers' Bul.* 3, 1910, pp. 4).—Results obtained in these experiments showed that nitrogen supplied from two sources could be better appropriated by mangels than when supplied in one form (sulphate of ammonia). Superphosphate gave better results than any other single class of phosphates. Muriate of potash gave better results than sulphate of potash, but when salt was added to the complete mixture of artificials, sulphate of potash showed the slightly better results. Salt added to the complete fertilizer produced an average increase in yield of 3 cwt. per acre.

"The following mixture per acre has given the greatest yield: One cwt. nitrate of soda, applied as a top dressing; and 1 cwt. sulphate of ammonia, 4 cwt. superphosphate, $\frac{3}{4}$ cwt. sulphate of potash, and 3 cwt. of salt, applied at planting time."

Spanish peanuts, A. H. WRIGHT (*Oklahoma Sta. Circ.* 19, pp. 4).—Notes on the production and handling of the peanut crop in Oklahoma, with a list of dealers in peanut machinery, are given.

Pifine and the Southdown feed industry (*Modern Sugar Planter*, 43 (1913), No. 29, pp. 2-5, figs. 4).—This article describes the methods used in the cutting, handling, and kiln drying of the pifine grass (*Panicum hemitumum*), which grows in abundance on the wet prairies of Louisiana. This grass, heretofore considered useless, when made into hay was found to analyze 4.1 per cent moisture, 8.35 per cent protein, 1.69 per cent fat, 36.36 per cent crude fiber, 23.28 per cent pentosans, 6.78 per cent ash, and 19.44 per cent undetermined. When dried it is ground and 22 parts mixed by weight with corn-and-cob meal, blackstrap molasses, and cotton-seed meal 50:20:8.

Experiments on the germination of seeds of *Poa pratensis*, S. TOMKA (*Kisérlet. Közlem.*, 15 (1912), No. 4, pp. 618-623).—It was shown by tests that these seeds germinated within a range of temperature reaching from 5 to 35° C.

Additional knowledge on the germination of *Oryza sativa*, M. AKEMINE (*Österr. Bot. Ztschr.*, 63 (1913), No. 5, pp. 194-200).—From various experiments conducted in 1910 and 1911 to study the method of germination of the rice kernel with regard to whether the radicle or the plumule appears first, the author concludes that a healthy rice kernel presents the plumule first under normal conditions, and that apparently the radicle will be presented first only in an abnormally dry medium.

Seed selection, S. L. WRIGHT (*Rice Jour. and South. Farmer*, 16 (1913), No. 8, p. 6).—This article describes 3 varieties of rice, viz, Blue Rose, Louisiana Pearl, and Early Prolific, that have been produced by seed selection. These varieties are of the crystal berry type, differing from the Honduras and Japanese types, and are said to be heavy yielders with exceptionally strong straw and of rapid, vigorous growth.

The cultivation of rice with the help of machines, F. MAIN (*Jour. Agr. Trop.*, 12 (1912), No. 137, pp. 321-325; *abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases*, 4 (1913), No. 2, pp. 209, 210).—It is here noted that success has attended the mowing of weeds in rice fields under water and sowing the seed directly in the field later. This avoids the labor of transplanting. Cutting the weeds and reeds under water results in their

asphyxiation and rapid decay. It is also stated that normal rice fields have been plowed successfully by machinery.

Investigations on the influence of injury and the loss of leaves of rye on the development of the spikes and kernels, O. SCHLUMBERGER (*Arb. K. Biol. Anst. Land u. Forstw.*, 8 (1913), No. 5, pp. 515-551, figs. 14).—Leaves of rye plants were removed by scissors and others slit into approximately 3 parts with a needle at 2 periods of growth, at the commencement of the shooting stage and at the beginning of the flowering stage. The effects of these treatments on the quality (size) and quantity (weight) were observed.

Either treatment had little influence on the kernel or head when given before the shooting stage, but when given just before the flowering stage the injury was considerable. The injury by removing all of the green leaves at the second period was scarcely more than by the removal of only the 2 youngest leaves. Slitting the leaves caused injury, but in much less degree than did removal. In general the injury was much greater to the kernels at the extreme ends of the heads than to those located within the middle third. The quantitative injury to the kernels was relatively greater than the qualitative injury in all cases. Chemical analysis showed practically no difference in the kernels from the different treatments.

The influence of the previous crop on the yield of rye, J. VON LENTS (*Illus. Landw. Ztg.*, 32 (1912), No. 78, p. 725, fig. 1).—Grain yields were produced of 1,822 kg. per hectare (1,621 lbs. per acre) following summer fallow. When lupines were plowed under in the flower, pod, and seed stages, the succeeding rye crops were 2,942, 2,503, and 1,844 kg., respectively. With barley as a previous crop the yield was 1,142 kg.

The varieties of soy beans found in Bengal, Bihar, and Orissa, and their commercial possibilities, E. J. WOODHOUSE and C. S. TAYLOR (*Mem. Dept. Agr. India, Bot. Ser.*, 5 (1913), No. 3, pp. 103-176, pls. 5).—The authors discuss the varietal characteristics, types, distribution, cultivation, yield, value, and uses of some soy beans found in cultivation in Bengal. Chemical analyses show the nitrogen content to range from 4.73 to 7.67 per cent, according to type. The highest oil content reported was 16.28 per cent.

Cambodia soy beans (*Agr. Prat. Pays Chauds*, 12 (1912), No. 116, p. 411; *Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases*, 4 (1913), No. 2, p. 210).—It is noted that soy beans have been successfully grown in Cambodia, Indo-China, containing 41.6 per cent of protein and 18.6 per cent of fat.

Soy beans—Why not? A. BUNN (*Country Gent.*, 78 (1913), No. 31, pp. 1138, 1139, fig. 1).—This article gives the results of some tests in Pennsylvania of soy bean varieties in regard to frost resistance.

Haberlandt (yellow) and Wilson (black) lost only 5 per cent of seed by remaining in the field during the winter, while other varieties lost as high as 60 per cent. "Volunteer seedings in 1912 and 1913 were in excellent condition, without exception, at oats plowing, which is about the middle of April."

Frost-resisting soy beans, A. BUNN (*Country Gent.*, 78 (1913), No. 44, p. 1614, fig. 1).—In this article the author relates his experience with Sable, Haberlandt, and Peking, 3 varieties of soy beans that resumed growth and made good yields after being cut down by a late frost. It is noted that when soy beans were planted with a grain drill as large yields of hay and grain were obtained, and with much less expense, as when planted in rows and cultivated.

The influence of phosphoric acid on the growth and development of sugar beets, H. WILFARTH, H. ROEMER, and G. WIMMER (*Ztschr. Ver. Deut. Zucker-indus.*, 1912, No. 680, pp. 1037-1107; *Bl. Zuckerrübenbau*, 19 (1912), Nos. 21,

pp. 330-335; 22, pp. 345-350; 23, pp. 361-366).—This article gives the results of a pot experiment in which phosphoric acid was used in various quantities, classed as insufficient, possibly sufficient, normal, and surplus, and combined in each case with 3 different amounts of nitrogen, designated as normal, heavy, and very heavy applications. Sugar beets were grown under these manurial applications in both moist and very moist soil conditions.

The largest average yield of beets was obtained with the normal application of phosphoric acid combined with the very heavy use of nitrogen. The analytical data show the roots to contain the highest amount of phosphoric acid where the largest amounts of both phosphoric acid and nitrogen were applied, and the largest amount of nitrogen when grown with the lowest application of phosphoric acid plus the largest application of nitrogen. The moisture content of the soil showed little influence on these figures. The sugar content of the beets was highest with the lowest amount of nitrogen combined with the 3 largest amounts of phosphoric acid, being 18.29, 18.28, and 18.3 per cent, respectively. Additional soil moisture seemed to cause a decrease in sugar content.

The percentage of pulp decreased with the increased applications of phosphoric acid up to the normal application, then increased, while in the very moist soil fluctuating results were obtained. With a small amount of nitrogen the ash and nitrogen-free pectin increased with the increase of phosphoric acid, while with the larger amounts of nitrogen the pectin content was greatest where the extremes of phosphoric acid application were made. Increased soil moisture had little influence on these results. Phosphoric acid seemed to have little influence on the content of invert sugar under any of the given conditions.

The most favorable manurial condition for top development seemed to be with the normal applications of nitrogen combined with the higher amounts of phosphoric acid. Increasing the quantity of nitrogen induced an abnormal growth of top.

Sugar-beet culture (*Sucr. Indig. et Colon.*, 81 (1913), No. 19, pp. 441-446).—Variety tests in 1912 yielded from 14,800 to 22,500 kg. per hectare (6.6 to 10 tons per acre) of roots, with a percentage of sugar ranging from 13.65 to 16.27 per cent. A classification was made according to the attitude of the foliage of the growing beets, i. e., erect, spreading, and intermediate, and 3 sizes of roots, large, small, and medium in each class, were analyzed, but no definite relation was discovered between density, purity or sugar content, and size or foliage.

Correlation between the size of seed ball and the germinative ability of beet seeds, H. PLAHN-APPIANI (*Bl. Zuckerrübenbau*, 20 (1913), No. 2, pp. 20-24, fig. 1).—The results given in this article show the germinative ability of beet seeds to decrease as the weight of the seed ball increases, and to increase with the size of the seed ball when based on count.

Some figures relative to beet seeds (*Sta. Agron. Aisne Bul.*, 1912, pp. 44-47).—Data are given showing the number of seed per kilogram of balls, the weight of 100 balls, and the 4 sizes into which the seeds may be divided. The large seeds gave the better results in producing strong vigorous plants.

Sugar-cane experiments in the Leeward Islands, F. WATTS ET AL. (*Imp. Dept. Agr. West Indies, Sugar-Cane Expts. Leeward Isl.*, 1911-12, pts. 1-2, pp. 111).—This is a detailed report of the results of variety tests with plant and ratoon canes and manurial experiments with cane, in continuation of work already noted (*E. S. R.*, 26, p. 837).

The study of sugar-cane varieties with a view to their classification, G. N. SAHASRABUDDHE (*West Indian Bul.*, 12 (1912), No. 1, pp. 378-387, pl. 1).—This paper reviews previous attempts toward botanical description and classifica-

tion of the varieties of sugar cane, and discusses as points for consideration the leaves, stem, internodes, nodes, eye-bud, and inflorescence.

The fuller's teasel, W. DALLIMORE (*Roy. Bot. Gard. Kew, Bul. Misc. Inform.*, 1912, No. 7, pp. 345-350; *abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases*, 4 (1913), No. 2, pp. 237, 238).—This article describes the cultivation of teasel in England, the United States, and France.

The production of bright tobacco by the flue and air curing processes, H. W. TAYLOR (*Agr. Jour. Union So. Africa*, 5 (1913), No. 6, pp. 880-909, figs. 12).—This article gives the history of the air and flue curing processes, with the advantages of each, and descriptions and diagrams of various kinds of drying barns. Varieties of tobacco to grow for each of these methods of curing are mentioned, and descriptions given of the best methods to employ in the production of bright tobacco, including selection and care of seed plants, seed beds, soil and its preparation and management, transplanting, cultivation, topping, suckering, ripening, harvesting, curing, preparation for market, and insect pests.

Trifolium parviflorum and *T. angulatum*, B. SZARTORISZ (*Kísérlet. Közlem.*, 15 (1912), No. 5, pp. 782-789).—From an exhaustive study of these annuals the author notes that they grow luxuriantly in wet weather conditions, that they improve the value of pastures where the soil contains an abundance of sodium, but otherwise are failures, that many of the seeds are hard-coated and do not germinate the first season, and that they seem to be immune to the attacks of the dodder.

Environmental influences on the physical and chemical characteristics of wheat, J. A. LECLERC and P. A. YODER (*U. S. Dept. Agr., Jour. Agr. Research*, 1 (1914), No. 4, pp. 275-291).—This article continues reports on work begun in 1909 (*E. S. R.*, 22, p. 730; 29, p. 835), in which soils from California, Kansas and Maryland were transported and compared with local soils of each of the 3 States and wheat grown on them.

It is noted "that in about 80 per cent of the samples investigated the weight of 1,000 grains of seed grown on different soils in any one locality was sufficiently uniform to permit the conclusion that climate and not soil is the chief factor affecting the size of the grain." It was found that the weight of a bushel of wheat ran more or less parallel with the weight of 1,000 kernels. In "classifying the grains of each sample into those which were wholly dark or flinty and those which appeared to be light brown or mealy, a remarkable uniformity is found in the groups arranged by locality in which they grew and a dissimilarity in groups arranged by the source of soil." From data obtained "it seems justifiable to conclude that climate is the principal factor influencing the protein content of wheat, and that soils, when used as in this experiment, have little or no influence."

It is noted that the fiber content of the kernel varied more widely than either the fat or gliadin, and that a greater influence was exerted by seasonal or climatic changes than by differences in soils. "The average ash content of all crops grown on each of the 3 soils, irrespective of the locality, showed but slight variation, being 2.13, 2.08, and 2.16 per cent for California, Kansas, and Maryland soils, respectively." In most cases the amounts of potash and of phosphoric acid rose and fell in the same proportion as the ash.

"Although the relationship or interdependence between the physical properties and chemical constituents does not show in these results as markedly as might be expected, such relationships may be distinctly traced in some of the constituents. Thus, as has often been pointed out by others, a distinct correlation exists between the protein content and the physical appearance or between

the protein content and the weight of 1,000 grains, high protein being more or less parallel with flintiness and with lightness of grains."

In studying the effect of disturbing the soil due to removal, transportation, and replacing, it was shown that "the crops from the plats which had been taken up in 3-in. layers and replaced had approximately the same physical and chemical characteristics throughout as the crops from the corresponding plats, which had not been thus disturbed. On the other hand, it is shown that the climatic factors collectively have a strong determining influence, especially upon the crude protein content, the ash content, and the percentage of phosphoric acid in the ash. The results from this experiment thus harmonize with the findings previously published, namely, that environment rather than what has been usually termed heredity is the major factor in determining the physical and chemical characteristics of the wheat crop. They indicate, further, that it is the climatic environment which exercises the primary influence of the environmental factors."

Breeding work with alternating wheat, M. SERVIT (*Monatsh. Landw.*, 6 (1913), No. 6, pp. 173-183, figs. 7).—Negative results are reported with experiments in which efforts were made during 1910 and 1911 to increase the yield of a variety of wheat which may be seeded alternately as a spring and a winter wheat.

On the stability of a dwarf variety of wheat, P. DE VILMORIN (*Jour. Genetics*, 3 (1913), No. 1, pp. 67-76, pl. 1, figs. 8).—In this paper the author gives results of selections, covering a series of years, of dwarf plants from a variety of common wheat. The dwarf character seemed to be dominant to the large character, but gave a ratio of 2:1 instead of 3:1, as might have been expected.

[Wheat production] (*Ann. Rpt. Ill. Farmers' Inst.*, 17 (1912), pp. 277-299).—Experiences in wheat growing, in which the yields reached 46.8 bu. per acre, are here related by E. W. Johnson, A. A. Hinkley, and others. An address on How Breeding Will Help Wheat Production in Illinois, by L. H. Smith, is included.

The employment of sulphuric acid for the destruction of weeds in the wheat field, E. RABATÉ (*Prog. Agr. et Vit. (Ed. l'Est-Centre)*, 33 (1912), Nos. 44, pp. 568-572; 45, pp. 591-595; 46, pp. 629-636, figs. 11).—After trials of sulphate of copper, sulphate of iron, and sulphuric acid in varying strengths, the author concludes that sulphuric acid in 6, 8, or 10 per cent solutions (the degree of strength depending upon local conditions) is the most satisfactory spray to use. The solution was applied at the rate of 1,000 liters per hectare (107 gal. per acre) and killed most of the annual weeds, but it did not perceptibly retard the growth of the wheat although the lower leaves were killed. This solution had the advantage of being effective in 3 or 4 hours, while the salt solution required 3 or 4 days. The sulphuric acid solution also had a fertilizing effect on the soil.

A complete description of the method of application and the apparatus used is also given.

HORTICULTURE.

Biennial report division of horticulture (*Oregon Sta. Bul.* 115, pp. 50, figs. 7).—This bulletin comprises the two following substation reports:

First biennial report, substation, Umatilla Experiment Farm, Hermiston, Oregon, R. W. Allen (pp. 5-46).—The author discusses the methods of procedure since 1909 in preparing the land at the substation for experimental purposes; outlines the experimental work in soil fertility, cover crops, irrigation, cultural and variety tests of fruits, vegetables, and ornamentals; and

gives the results thus far secured. See also a previous note (E. S. R., 29, p. 540).

Report of the Southern Oregon Experiment Station, F. C. Reimer (pp. 46-50).—A similar but briefer report of the new substation at Talent, Oreg.

[Report of the] division of horticulture, H. T. EDWARDS (*Philippine Agr. Rev. [English Ed.]*, 6 (1913), No. 12, pp. 619-629, pls. 4).—This is a brief progress report on work with fruits, vegetables, and other plants at the Singalong and Lamao experiment stations and on work at the Ilagan tobacco station including also notes on the seed and plant distribution, the banana and tropical fruit collection, apiculture, locust extermination, and miscellaneous entomological work.

Spraying, W. J. ALLEN (*Dept. Agr. N. S. Wales, Farmers' Bul.* 72, 1913, pp. 23).—Directions are given for the preparation and use of various spray mixtures, including a spraying calendar for the treatment of insect pests and plant diseases.

Florida trucking for beginners, L. L. BATEMAN (*DeLand, Fla.*, 1913, pp. 205, figs. 5).—A popular treatise in which, in addition to cultural details, information is given relative to the development and management of a truck farm in Florida.

The forcing and blanching of dasheen shoots, R. A. YOUNG (*U. S. Dept. Agr., Bur. Plant Indus., Forcing and Blanching of Dasheen Shoots*, pp. 6, figs. 5).—In continuation of previous investigations (E. S. R., 29, p. 336) the author here describes a method of forcing and blanching dasheen shoots to be used as a fresh vegetable during the winter. The treatment here discussed is based on greenhouse experiments conducted cooperatively by the Bureau of Plant Industry and J. H. Kellogg at Battle Creek, Mich. In addition to cultural details instructions are given for handling and keeping the shoots, together with suggestions relative to their culinary uses.

Tomato culture, S. F. ANDERSON (*New Zeal. Dept. Agr., Indus., and Com. Bul.* 33, n. ser., 1913, pp. 24, figs. 9).—A popular treatise on the forcing house and the field culture of tomatoes.

The present status of the fruit industry of the Dominion of Canada, W. T. MACOUN (*Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases*, 4 (1913), No. 12, pp. 1812-1819).—A popular account, in which the fruit industry of Canada is briefly considered with reference to its history, kinds of fruit grown, fruit districts, export statistics, varieties and breeding, cultivation and marketing, and government aid to fruit growers.

Progress and results in fruit growing in Germany, A. LOEGUS (*Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases*, 4 (1913), No. 4, pp. 506-513).—A summarized account of the activities of German pomologists and fruit growers in the improvement and extension of commercial fruit growing in Germany.

Blooming periods and yields of fruit in relation to minimum temperatures, A. B. BALLANTYNE (*Utah Sta. Bul.* 128, pp. 245-261, figs. 10).—In this bulletin the author shows in a series of tables and charts the blooming periods and yields of different kinds and varieties of fruits, together with the minimum temperatures at the Southern Utah Experiment Farm for the years 1903 to 1910, inclusive.

The data appear to show definitely that this area is totally unfitted for the production of nuts or stone fruits, such as peaches, plums, and cherries. Frosts occurring at the blooming time were severe enough to destroy practically all of the crops of the first 3 years after the trees began blooming and to reduce the crops severely in subsequent years. Frosts of from 5 to 9° were less damaging

when the buds were moist than those of a similar or slightly greater severity when the buds were dry.

A preliminary report on the pollination of the sweet cherry, V. R. GARDNER (*Oregon Sta. Bul. 116, pp. 40, pls. 12*).—In the attempt to secure pure bred seeds of a number of varieties of the sweet cherry for use in further breeding investigations, considerable data were secured in 1911 and in 1912 which tended to show that some varieties of the sweet cherry are practically self-sterile and that certain varieties are much better pollenizers than others for the Napoleon, Lambert, and Bing varieties. The work was considerably extended in 1913 to determine, if possible, whether certain sweet cherry varieties are intersterile as well as self-sterile. The results secured during the 3 seasons are here presented in tabular form and discussed.

All of the varieties tested were found to be self-sterile. On the other hand, the pollen of each of the varieties tested is capable of producing a set of fruit on the variety or varieties with which it is interfertile. Certain of these varieties, such as Bing, Lambert, and Napoleon were intersterile, hence mixed plantings of such varieties can not be expected to set fruit unless the trees are within the range of influence of some other variety or varieties that are interfertile with them. Black Republican, Black Tartarian, and Waterhouse seem to be the most efficient pollenizers for the intersterile group, although other varieties were more or less effective. Certain of the seedling trees found in and about cherry orchards were efficient pollenizers for the Bing, Lambert, and Napoleon. At least some members of the Duke group of cherries and of the sour cherry group are capable of pollinating some of the Bigarreaus. Intersterility of sweet cherry varieties is apparently not correlated with their closeness of relationship.

The author's observations during the 3 seasons lead him to conclude that abnormal cherries may be developed on self-sterile, intersterile, and interfertile varieties alike if aphids happen to attack the leaves and pedicels in the flower cluster. The fruit that is developed is very much undersized though the stone is nearly normal. The question is raised as to whether or not this development of fruit as a result of aphid stimulation is akin to the development of parthenocarpic fruit.

Commercial peach growing in Michigan, F. M. BARDEN and H. J. EUSTACE (*Michigan Sta. Special Bul. 63, pp. 30, figs. 12*).—A practical treatise on the establishment, care, and management of a commercial peach orchard, including a financial statement covering a period of 6 years of a 15-acre peach orchard.

Systems of planting for orchards, N. O. BOOTH (*Oklahoma Sta. Circ. 20, pp. 8, figs. 7*).—In this circular the square, hexagonal or triangular, and quincunx systems of planting orchards are illustrated and described.

Fruit packages in the Middle West, L. G. HERRON (*Oklahoma Sta. Circ. 21, pp. 3-27, figs. 28*).—In this circular the author points out the relative merits of various styles of fruit packages in actual use.

Preserving fruits for exhibition purposes, N. O. BOOTH (*Oklahoma Sta. Circ. 22, pp. 3*).—This circular contains instructions and formulas for preserving various fruits and vegetables for exhibition purposes.

The rational manuring of fruit trees and grapevines, R. DUMONT (*La Fumure raisonnée des Arbres fruitiers et de la Vigne. Paris [1913], pp. 191, figs. 11*).—A practical treatise similar to the above on the manuring of fruit trees and grapes grown both under glass and in the open.

The cultivation of the vine under glass, S. F. ANDERSON (*New Zeal. Dept. Agr., Indus., and Com. Bul. 40, n. ser., 1913, pp. 35, figs. 20*).—A popular treatise on the culture of greenhouse grapes, including directions for preparing the soil and constructing a vine house.

Commercial strawberry culture, S. B. SHAW (*Bul. N. C. Dept. Agr.*, 34 (1913), No. 8, pp. 24, figs. 14).—A practical treatise on strawberry culture in North Carolina, based on investigations conducted on the Pender Test Farm and throughout the commercial strawberry sections. A chapter on strawberry insects, by F. Sherman, Jr., is included.

Manurial experiments on cacao, 1912-13, J. DE VERTEUIL (*Dept. Agr. Trinidad and Tobago Bul.*, 12 (1913), No. 76, pp. 205-216).—This report contains yield data for the year ended August 31, 1913, for manurial experiments which are being conducted on a number of private cacao plantations. Data were also secured on the natural yield of plats on 8 cacao estates situated in different parts of the island with the view of determining what factor or factors other than manures affect the yield of cacao trees. The results, as here tabulated, indicate that the yield of a group of cacao trees forming a plat is susceptible to very large variations and that the yield tendencies on any particular plat should be well known before manurial experiments are undertaken.

California citrus culture, A. J. COOK (*Sacramento, Cal.: State Com. Hort.*, 1913, pp. 121, figs. 68).—A practical treatise on the establishment, culture, and management of citrus groves in California, including information relative to various citrus diseases and insect pests and their control, methods of marketing, etc.

An extensive bibliography on citrus fruits is appended.

Date cultivation in the Punjab, D. MILNE (*Lahore, Brit. India: Govt.*, 1913, pp. III+20, pls. 7).—A practical treatise based upon the author's observations in Egypt and India and on the literature of date culture in various countries.

The palms of British India and Ceylon, indigenous and introduced, E. BLATTER (*Jour. Bombay Nat. Hist. Soc.*, 20 (1910), Nos. 1, pp. 33-64; 2, pp. 347-360; 20 (1911), Nos. 3, pp. 675-705; 4, pp. 981-995, 21 (1911), No. 1, pp. 66-86; 21 (1912), Nos. 2, pp. 343-391; 3, pp. 912-968; 22 (1913), No. 1, pp. 67-86, pls. 50, figs. 31).—This comprises a series of descriptive articles on the native and introduced palms of British India and Ceylon. In addition to a detailed botanical description each species is considered with reference to its bibliography, nomenclature, distribution, and habitat, together with the cultivation and uses in the case of economic species. An extensive bibliography on palms is included in the introductory chapter. The text is fully illustrated.

The selection of the tea plant, C. BERNARD and P. VAN LEERSUM (*Dept. Landb., Nijv. en Handel [Dutch East Indies], Meded. Proefstat. Thee*, 1913, Nos. 21, pp. 30, pls. 12; 26, pp. 15, pls. 4).—In continuation of previous tests relative to the germination of tea seed selected according to its specific gravity in water and in sugar solutions (E. S. R., 24, p. 41), the results to date are here reported of a test of various types of Assam tea, including imported types and those grown in Java from Assam seed.

Observations of the young plants have shown that seed which sinks in water produces more vigorous plants than seed which floats in water, and that the most vigorous plants are produced from seed which sinks in a 25 per cent sugar solution. Favorable results have been secured against troubles in the seed bed by disinfecting the seed with corrosive sublimate solution. The selected plants have been budded on thrifty stocks for further observation.

Green manuring, G. D. HOPE and A. C. TUNSTALL (*Indian Tea Assoc., Sci. Dept. Quart. Jour.*, 1912, No. 4, pp. 99-103, pl. 1; 1913, Nos. 1, pp. 22-25; 2, pp. 43-47, pl. 1; 3, pp. 73-78).—A series of articles comprising a general discussion of the subject of green manuring, including notes and data on the use of various cover crops for manuring tea.

Ornamental hibiscus in Hawaii, E. V. WILCOX and V. S. HOLT (*Hawaii Sta. Bul.* 29, pp. 60, pls. 16).—This bulletin contains detailed descriptions of a large number of native, introduced, and hybridized ornamental forms of hibiscus that have been under observation at the Hawaii Station. A number of these forms are shown in color and the methods of culture, directions for hybridizing, and some of the hybrids are described at length. Brief reference is also made to the insects and diseases of hibiscus.

The rational manuring of flowers and ornamental plants, R. DUMONT (*La Fumure raisonnée des Fleurs et des Plantes ornementales*. Paris, [1913], pp. 152, figs. 21).—A practical treatise on the manuring of flowers and ornamental plants, based largely on experimental results secured by the author and other investigators. The succeeding chapters discuss the nutrition of plants; horticultural soils; horticultural fertilizers; soils, composts, and amendments used in horticulture; and the manuring of flowers and ornamental plants growing in the open, in pots, and under glass.

Garden trees and shrubs, W. P. WRIGHT (*London*, 1913, pp. 337, pls. 84, figs. 11).—In part 1 of this popular work the author discusses the beauty and value of shrubs and trees for various situations. Part 2 deals with the arrangement, propagation, planting, culture, and care of trees and shrubs. Part 3 forms a guide to the selection of trees and shrubs for various effects and purposes. Part 4 comprises a descriptive account of the principal trees and shrubs. The work is fully illustrated with colored plates and half-tone engravings.

Shrubs of Florida, J. K. SMALL (*New York*, 1913, pp. X+140).—A handbook of the native and naturalized shrubs of Florida, including a key to the orders considered.

The useful plants of New Caledonia, E. HECKEL (*Les Plantes Utiles de Nouvelle-Calédonie*. Marseille and Paris, 1913, pp. 93, pls. 41, figs. 7).—This comprises descriptive notes with illustrations of a number of economic plants observed by the author in New Caledonia.

FORESTRY.

The American woods, illustrated by actual specimens with full text, XIII, R. B. HOUGH (*Lowville*, N. Y., 1913, pp. VI+49, pls. 13, wood sections 25).—The present volume of this series (E. S. R., 26, p. 442) contains sets of wood sections of 25 tropical species growing in southern Florida and the adjacent keys. A systematic study of the species represented accompanies the wood sections, together with a series of photographic pictures of characteristic barks and foliage.

Specific gravity and weight of the most important American woods, A. GASKILL (*Forestry Quart.*, 11 (1913), No. 4, pp. 527-530).—The author here presents a table showing the specific gravity and weight of the most important American woods. In order to reduce or harmonize the contradictions that appear in published figures on the subject comparisons were made between all available data, and specimens of every species were carefully analyzed and compared. Densities were then more or less arbitrarily assigned which recognize the inherent characters of the individual species.

Relation of precipitation to tree growth, M. N. STEWART (*Mo. Weather Rev.*, 41 (1913), No. 9, p. 1287).—The author made a series of measurements of an oak stump in order to discover, if possible, whether the precipitation of previous years directly affected the ring widths and, if so, to determine the comparative amounts of rainfall during periods for which no records exist. The comparisons were confined to the precipitation during the growing season.

The author concludes that June and July precipitation seems to have most effect upon the width of oak rings. Decrease of width more than 0.5 mm. below normal would appear to be quite certain indication of a subnormal summer rainfall. Although an increase in width did not necessarily appear to be an effect of extra abundant rainfall, this holds in 62 per cent of the cases.

It is pointed out that, generally speaking, the examination of this tree does not show an accurate ratio between ring width and the rainfall since other unknown factors, such as temperature, insect pests, height of surrounding timber, etc., have a disturbing influence.

The present status of cultural experiments with foreign timber species in the state forests of Saxony, F. W. NEGER (*Naturw. Ztschr. Forst u. Landw.*, 12 (1914), No. 1, pp. 1-11).—Notes are given on the present status and condition of a number of foreign timber species which have been under observation in the state forests of Saxony during the past 10 years.

The forest flora of New South Wales, J. H. MAIDEN (*Sydney, N. S. Wales: Govt.*, vol. 5, 1910, pts. 1, pp. 19; 2, pp. 21-52; 1911, pts. 3, pp. 53-68; 4, pp. 69-89; 5, pp. 91-103; 6, pp. 105-124; 1912, pts. 7, pp. 125-145; 8, pp. 147-158; 9, pp. 159-177; 10, pp. 179-191, pls. 67; *Index*, 1913, pp. XI).—This is the fifth of a series of volumes on the forest flora of New South Wales, the first of which was issued in 1903. In the present volume 38 species are described, each species being considered with reference to its botanical characteristics, common and scientific nomenclature, size, habitat, economic products, and propagation.

Atlas of the tree species of Java, S. H. KOORDERS and T. VALETON (*Atlas der Baumarten von Java. Leiden, Netherlands, 1913, vol. 1, Nos. 1, pp. VII, pls. 50; 2, pls. 50; 3, pls. 50, 4, pp. 14, pls. 50*).—This atlas, which is issued in 4 parts, constitutes an appendix to the author's series of contributions on the tree species of Java (*E. S. R.*, 25, p. 142). The illustrations for each species in the atlas consist of a flowering twig, floral and leaf parts, and in most cases a sketch showing the general appearance of the tree. No descriptions accompany the illustrations, but reference is made to the descriptive text in the authors' previous publications.

Some Douglas fir plantations.—III, Llandinam plantation, Montgomeryshire, F. STORY (*Jour. Bd. Agr. [London]*, 20 (1913), No. 8, pp. 690-696, figs. 2).—In continuation of previous observations on Douglas fir plantations (*E. S. R.*, 30, p. 46) growth and yield tables are given for a 28-year-old stand growing in mixture with larch in Montgomeryshire, North Wales.

Lupine straw as a means of improving the growth of fir stands on drifting sand, E. HESSELINK (*Cultura*, 25 (1913), No. 304, pp. 455-466, pl. 1, figs. 5).—In the experimental tests here reported lupine straw was used as a ground covering and compared with the sparse native vegetation which was simply mowed and left on the ground. Stands of fir in which the lupine straw was used were found to make a much greater root and top development.

Forest management of loblolly pine in Delaware, Maryland, and Virginia, W. D. STERRETT (*U. S. Dept. Agr. Bul. 11, pp. 59, pls. 5, fig. 1*).—In order to show the financial possibilities in growing loblolly pine in Maryland, Delaware, and Virginia the author here presents and discusses data dealing with the rate of growth and yield; past, present, and prospective lumber prices; cost of lumber production; stumpage values; expectation values for different initial investments, rotations, types of soil, and distances from market; cost of various silvicultural operations; and size, volume, and yield tables. The best systems of management are described, and the loblolly pine is also considered with reference to its nomenclature, botanical and silvical characteristics, utilization, and characteristics of the wood.

Eucalypts, R. DE NOTER (*Les Eucalyptus*. Paris, 1912, pp. 119, figs. 37).—A compilation of information on the eucalypts dealing especially with their culture, exploitation, vegetative and industrial qualities, and medicinal properties. The subject matter is prepared with special reference to the extension of eucalyptus culture in the French colonies.

Recent contributions to the knowledge of the genus *Hevea*, J. HUBER (*Bol. Mus. Goeldi Hist. Nat. e Ethnog.*, 7 (1910), pp. 199-281, pl. 1).—A series of papers, in the first of which the author discusses the systematic and geographical distribution of the genus *Hevea*. In the second paper consideration is given to a number of species of *Hevea* found along the Rio Iça-Putumayo. In the third paper the distribution of *Hevea* species in Para is discussed and in the fourth the author reports an investigation of the variability of characters in the genus *Hevea* with reference to the possibilities of a selection method. Special consideration is given to the variations in seed characters.

The forest problem in Chili, F. ALBERT (*Bol. Bosques, Pesca i Caza*, 1 (1913), No. 10, pp. 649-719, pl. 1, figs. 81).—A survey of forest conditions in Chili with recommendations for the conservation and extension of the forest resources of that country.

Some aspects of European forestry, A. B. RECKNAGEL (*Forestry Quart.*, 11 (1913), No. 4, pp. 470-498).—In continuation of previous papers on this subject (*E. S. R.*, 29, p. 842), the author here discusses methods of natural and artificial regeneration in Austria.

Annual report of the director of forestry of the Philippine Islands for the fiscal year ended June 30, 1913, G. P. AHERN (*Ann. Rpt. Dir. Forestry P. I.*, 1913, pp. 65, pls. 6).—A progress report on the administrative, investigational, and reconnaissance work in the Philippines for the year ended June 30, 1913.

The appendix contains statistics relative to the certification of public lands; amounts of important timbers, by species, cut; revenues and expenditures; timber licenses in force; utilization of forest products; and exports and imports.

Annual progress report upon state forest administration in South Australia for the year 1912-13, W. GILL (*Ann. Rpt. State Forest Admin. So. Aust.*, 1912-13, pp. 12, pls. 7).—A statistical report for the year ended June 30, 1913, relative to the extent of forest reserves, planting and other forest operations, distribution of trees, revenues, expenditures, etc.

The conservation of wood, R. BARBIER (*Rev. Vit.*, 40 (1913), Nos. 1037, pp. 516-520; 1039, pp. 574-580).—This paper, which was presented at the International Congress of Forestry, Paris, 1913, comprises an exposition on the natural and artificial processes of preserving wood.

The transportation of wood in the colonial forests, A. JOLYET (*Le Transport des Bois dans les Forêts Coloniales*. Paris, 1912, 2. ed., rev., pp. 60, figs. 16).—A descriptive account of methods of exploiting and transporting logs in the French colonies.

Forest fire protection by the States as described by representative men at the Weeks law forest fire conference, edited by J. G. PETERS (*U. S. Dept. Agr., Forest Serv., Forest Fire Protection by States*, pp. 85, pls. 2, fig. 1).—This comprises the papers, addresses, and discussions at the conference of federal and state officials and other representatives of various forest interests, held at Washington, January 9-10, 1913, to discuss informally cooperation in the protection from fire of the forested watersheds of navigable streams, as provided for under section 2 of the Weeks law (*E. S. R.*, 24, p. 498). An appendix contains forms of agreement between the Department and the States and telephone companies with reference to fire protection.

The use of vegetation for reclaiming tidal lands, G. O. CASE (*London, 1913*, pp. 36, figs. 9; *Engineering* [London], 96 (1913), Nos. 2486, pp. 264, 265; 2489, pp. 344-347, 349, figs. 9).—An account of the utilization of various plants and trees in the reclamation of tidal lands in different countries.

DISEASES OF PLANTS.

Report of phytopathological observations, 1911 and 1912, E. MARCHAL (*Min. Agr. et Trav. Pub. [Belgium], Off. Rural Raps. et Communs.*, 1913, No. 7, pp. 71-85, figs. 2; *Ann. Sta. Agron. Etat. Gembloux*, 2 (1913), pp. 367-383, figs. 2).—Brief notes are given of observations relating to *Urocystis occulta*, *Puccinia glumarum*, and *P. graminis* on grain plants; *Septoria petroselinii apii* on celery; a threatening extension of *Exobasidium azaleæ* near Ghent; a rust of currant, possibly due to a form of *P. caricis*; a pear tree rust not named, also *S. piricola* on pears; leaf scald of grape; *Ustilago hordei* on winter barley; *Phytophthora infestans*, *Macrosporium solani*, and *Chrysophlyctis endobiotica* on potatoes (the last named being treated at some length); a lettuce fungus, possibly a form of *Æcidium lactuæ sativæ*; an oïdium on currants; *Lophodermium brachysporum* on pine needles; and a threatening leaf spot disease of *Aspidistra*, provisionally accredited to *Pyrenochaeta bergervini*.

Report on plant diseases, R. SCHANDER ET AL. (*Mitt. Kaiser Wilhelms Inst. Landw. Bromberg*, 6 (1912), No. 1, pp. 42-58).—The author presents notes by himself and associates regarding investigations carried on in plant chemistry, morphology, physiology, and pathology, the last named relating to *Fusarium nivale* on winter wheat, loose smut of barley and wheat, leaf spot of wheat associated with nematode attack, the physiology of *Phoma betæ*, and several potato fungi.

Report on plant protection of the experiment station for agricultural chemistry at Görz, 1912, J. BOLLE (*Ztschr. Landw. Versuchsw. Österr.*, 16 (1913), No. 4, pp. 299-303).—It is stated that the wet summer and fall of the previous year resulted in an observed greater prevalence of fungus diseases. Spraying the under side of grape leaves for *Peronospora* did not seem to give any decided advantage over the ordinary method. Forhin, a mixture giving off ammonia fumes, said to have been recommended from Germany for *Peronospora*, spotted the leaves without checking the fungus. *Exoascus deformans*, appearing very early on peach leaves, was treated with a spray containing 1 per cent copper sulphate, 0.5 quicklime, and 0.5 ammonium chlorid. The leaves were killed, but the new leaves which appeared were free from peach curl late in summer. The treatment is to be modified and extended to other stone fruits.

A brief report is given also on insect injuries observed.

Root nematodes, A. VUILLET (*Rev. Phytopath.*, 1 (1913), No. 2, pp. 17-19, figs. 3; *abs. in Riv. Patol. Veg.*, 6 (1913), No. 6, pp. 187-189).—A brief discussion of the characteristics, distribution, biology, and economic importance of *Heterodera radiculicola* in relation to crops is given. The author recommends, as protection therefrom, the employment of 240 gm. carbon bisulphid per square meter of soil, repeated after an interval of 15 days.

Notes on a cereal disease, V. W. PASTOR (*Memoria é Instrucciones para combatir la plaga de los cereales de Olot, conocida con el nombre de "Boixat."* Gerona, Spain: Cons. Prov. Fomento, 1913, pp. 7).—A nematode attacking wheat and rye, but not barley, in the vicinity of Olot in northeast Spain, is thought to be *Tylenchus devastatrix*. This is said to cause loss also by attacking onions, beans, and hyacinths in this region.

Appearance and treatment of stinking smut, O. APPEL (*Mitt. Deut. Landw. Gesell.*, 28 (1913), *Beilage No. 16*, pp. 1-3, figs. 3).—Noting unusually severe outbreaks of stinking smut during the current year, the author recommends the treatment of seed grain with 0.25 per cent formaldehyde for from 10 to 15 minutes. A second treatment recommended is steeping in 0.5 per cent copper sulphate for from 12 to 16 hours, followed by 1 per cent lime solution for $\frac{1}{2}$ hour.

Tests of the hot water treatment of barley and spring wheat at the Pentkowa Experiment Farm, 1912, K. BIELER (*Illus. Landw. Ztg.*, 33 (1913), No. 58, pp. 533-535, fig. 1).—In the treatment of barley and spring wheat seed with water at 25 to 30° C. for 4 hours and for 5 to 16 minutes at 50 to 52° it was found that barley seed was lowered in germinability when the temperature exceeded 51°, while the wheat underwent a temperature of 52° without injury.

Antecedents and history of a disease of garlic, V. W. PASTOR (*Antecedentes é Historia de la enfermedad de los Ajos, denominada "Boirat" en Bañolas. Gerona, Spain: Cons. Prov. Fomento, 1913, pp. 15, pl. 1*).—A disease of garlic is described which has been known for some years around Bañolas in northeastern Spain and which has recently been the cause of considerable damage. It is said to be noted in connection with the bulb mite (*Rhizoglyphus echinopus*) with which was associated also a bacillus, possibly *B. omnivorus* or *B. cepivorus* reported on bulbs by Delacroix (*E. S. R.*, 18, p. 745).

On the effect of spraying potatoes with soda Bordeaux mixture, J. PORTER (*Herefordshire County Council Farmers' Bul. 1, 1910, pp. 4*).—Instead of the lime Bordeaux, a mixture was used consisting of 12 lbs. sulphate of copper, 15 lbs. pure washing soda, and 100 gal. of water. The spray was effective in preventing potato disease, especially when both the upper and lower surfaces of the leaves were sprayed. The yield was increased 1 ton 12 $\frac{3}{4}$ cwt. per acre.

Treatment for nematodes, L. BRUNEHANT (*Bl. Zuckerrübenbau, 20 (1913), No. 19, pp. 289-291*).—The author reports improvement in the yield of ground infested with beet nematodes by applying stable and chemical manures and growing the crops in rotation. The order of rotation was beets, wheat, oats, and alfalfa followed by succession of wheat, beets, wheat, oats, and rye or potatoes, with superphosphate or liquid and other manures.

Selection and treatment of cane seed, J. R. JOHNSTON (*Porto Rico Sugar Producers' Sta. Bul. 6 (English Ed.), pp. 29*).—A study was made of the relative value of different parts of the sugar cane stalk for planting, germination and disease resistance being considered.

The author concludes that, other things being equal, top seed give better results than body seed. Only healthy cane should be used in planting and special efforts should be made to avoid seed from cane affected by the pineapple disease, red rot, rind disease, top rot, and root rot.

Experiments with a number of fungicides showed that when the seed was planted under good conditions there was no perceptible improvement in germination, but when disinfectants were applied to infected seed or good seed planted under poor conditions there was a considerable increase in the percentage of germination. The author states that seed cane exposed to the air becomes infected with a number of fungi. Where a large amount of pineapple disease is present all seed should be treated with Bordeaux mixture. Also seed that is not to be planted immediately or that that is to be shipped should be similarly treated. While the presence of diseased leaf sheaths on seed cane would not affect germination or subsequent growth, the author claims that they should be removed when mealy bugs are abundant or when the seed is to be treated.

A bibliography is appended.

Black rot of tobacco, R. RAPAICS (*Magyar Dohánynejsag*, 30 (1913), No. 4, pp. 2-4; abs. in *Internat. Inst. Agr. [Rome]*, Mo. Bul. Agr. Intel. and Plant Diseases, 4 (1913), No. 4, p. 659).—A destructive disease attacking tobacco during its fermentation and decomposing the leaves, said to be unknown in Europe until recently, is reported from Hungary. The trouble is stated to be due to the activity of *Sterigmatocystis (Aspergillus) nigra*. No remedy has as yet been announced.

The mosaic disease of tobacco, H. A. ALLARD (*U. S. Dept. Agr. Bul.* 40, pp. 33, pls. 7).—The results of a preliminary series of investigations on the cause of mosaic disease of tobacco and other solanaceous plants are given.

This disease the author found was communicable to a large number of solanaceous plants but not to plants of other families. It is said to be quite similar to the mosaic disease of pokeweed. The mosaic virus permeates all parts of the plant but does not infect the embryos of the seed; therefore such seed will produce healthy plants. Once initiated, the disease becomes a progressive, incurable malady. It was found possible to infect plants with the sap of mosaic plants which had been passed through a filter.

Certain species of aphids are considered active disseminators of the mosaic disease, and observations made in the field show that they may sometimes be responsible for the occurrence of the disease in the seed bed and its subsequent spread in the field. In these experiments cutting back, repotting, or otherwise subjecting plants to unfavorable conditions did not prove sufficient to produce infectious mosaic symptoms. Physiological disturbances in the plants are not believed to be an adequate cause of this disease, and the author believes that organisms are its primary cause, although none have yet been isolated.

A new disease of cucumbers, ALTHEIMER (*Prakt. Bl. Pflanzenbau u. Schutz*, n. ser., 11 (1913), No. 9, pp. 109-112).—The author reports the receipt from Schwaben of cucumber leaves spotted by a fungus which is said to be identical with *Corynespora maei (C. melonis)*, already destructive in England and Holland. Its possibilities for harm are said to be great, especially where phosphoric acid is lacking. It is said to be carried with the seed, and it is recommended that the latter be treated with copper sulphate of 2 per cent strength before being used or shipped.

Tomato rot, L. PAVARINO (*Riv. Patol. Veg.*, 6 (1913), No. 6, pp. 161-163).—The author states that tomato rot, noted by Groenewege (*E. S. R.*, 29, p. 246) as due to an organism described under the name *Phytobacter lycopersicum* n. sp., is identical with that already described by himself (*E. S. R.*, 25, p. 148) and named *Bacterium briosii* n. sp.

Experiments on the control of the cedar rust of apples, H. S. REED, J. S. COOLEY, and C. H. CRABILL (*Virginia Sta. Bul.* 203, pp. 28, figs. 11).—After describing the cause of the rust of apples, symptoms, and effect, the authors give an account of spraying experiments carried on during 1911, 1912, and 1913.

Lime sulphur, iron lime sulphur, copper lime sulphur, atomic sulphur, Bordeaux mixture, iron Bordeaux mixture, and mercuric bichlorid were tested, and data are presented indicating the amount of reduction in disease, as shown by leaf infections. The experiments indicate that certain spray materials have great value in controlling cedar rust in the orchard, copper lime sulphur, a new fungicide, being very efficient in this respect. Ordinary lime sulphur and Bordeaux mixture were also found to give good results.

In the course of the experiments it was found that the maximum infection takes place only during the very early stages of leaf development. If the weather conditions are unsuitable for the development of sporidia, the infection will not appear on the earlier leaves.

In a laboratory experiment on the effect of the different spray materials on the germination of sporidia, all of the fungicides were found to reduce germination materially.

While spraying was found efficient in controlling apple rust, it is thought that it would be cheaper and more effectual to remove cedar trees from the vicinity of orchards.

Evaporation of water by normal or by chlorotic leaves of pear, J. CROCHETELLE (*Jour. Agr. Prat.*, n. ser., 26 (1913), No. 41, pp. 469, 470).—The author reports an average hourly evaporation per square centimeter from the surface of green and of chlorotic pear leaves of 5.72 and 1.76 mg., respectively. This is considered to show a freer circulation of water in the green leaves.

On a disease of greengage trees caused by *Dermatella prunastri*, W. J. DOWSON (*New Phytol.*, 12 (1913), No. 6, pp. 207-216, figs. 3).—An investigation was begun on a disease of greengage plum trees which was carried little beyond the identification of the fungus and determining some facts regarding its life history when the work was terminated, but the author presents the results as far as they had been conducted, giving an account of the isolation of the fungus, field observations, inoculation experiments, etc.

It is stated that the greengages were chiefly attacked, but that the fungus has also been found on other varieties. Diseased branches and twigs die back and the dead branches show the presence of the fruiting bodies of the fungus. Inoculation experiments were begun which indicate that infection takes place through wounds. The mycelia arising from both conidia and ascospores were grown on nutrient agar and sterilized pieces of greengage wood, and pycnidia were produced in about three weeks. The mycelium was found present in all the tissues of the host, particularly in the wood and pith. Its advance into a branch is preceded by gumming in the woody elements. Inoculation of healthy trees with the mycelium of *D. prunastri* is said to have led to infection.

Silver-leaf disease, F. T. BROOKS (*Jour. Bd. Agr. [London]*, 20 (1913), No. 8, pp. 682-690, pls. 2).—A summary account is given of the author's investigations and observations on the silver-leaf disease in continuation of the report previously noted (*E. S. R.*, 20, p. 847). The present article deals principally with the part played by *Stereum purpureum* in causing the disease.

The anthracnose of the mango in Florida, S. M. McMURRAN (*U. S. Dept. Agr. Bul.* 52, pp. 15, pls. 4, figs. 4).—The results of a study of the mango anthracnose, due to *Colletotrichum gloeosporioides*, in Florida together with some spraying experiments for its control are given.

The author states that the production of mangoes is seriously interfered with in certain seasons by this fungus, which attacks not only the flower clusters, fruits, and leaves, but also the young shoots. The blossom blight form of the disease is said to be the most serious, and the amount of damage is dependent on weather conditions, moist, showery weather being ideal for its rapid development.

So far as the spraying experiments in Florida are concerned, spraying proved of little value in preventing the blighting of the blossoms during rainy seasons at blooming time, though it served to keep the panicles and fruits free from infection. The author believes that seasons will never be so dry but that spraying will have to be resorted to in order to keep fruits free from disease after they have set.

Court-noué, L. RAVAZ (*Vie Agr. et Rurale*, 2 (1913), No. 27, pp. 10-13).—The author discusses briefly the present distribution of court-noué under its various names, its characters, its alleged causes, its conditions of development (including susceptible or resistant varieties), and suggested preventive measures,

including employment of resistant stocks named, close in preference to wide planting, and replanting with stocks from roncet free localities.

Court-noué associated with acarirose in Swiss vineyards, H. FAES (*Vie Agr. et Rurale*, 2 (1913), No. 27, pp. 14-17, fig. 1).—Claiming that court-noué of grapevines, associated with general or physiological conditions in France, as held by Ravaz (E. S. R., 29, p. 551), and in Italy, according to Pantanelli (E. S. R., 28, p. 851), is due in Switzerland and Austria to the presence of an acarid (*Phyllocoptes vitis*), previously described in connection with vine injury (E. S. R., 24, p. 168), the author suggests the application in February or March of alkaline polysulphid in 3 per cent solution.

Studies on grape downy mildew, G. DE ISTVÁNEFFI and G. PÁLINKÁS (*Ann. Inst. Cent. Ampéol. Roy. Hongrois*, 4 (1913), pp. 125, pls. 9, figs. 2; *abs. in Gard. Chron.*, 3. ser., 54 (1913), No. 1046, p. 402).—This is a fuller account of studies pursued for several years and in part already reported (E. S. R., 29, p. 350). It deals in considerable detail with the relations between plant and parasite, discussing also some points still under investigation.

It is stated that the germ tube enters by the stoma, forming beneath a secondary spore, which throws out branching filaments. The oil spots are centers of infection and are due to the presence of mycelium in and around the stomata. In the leaf the hyphæ appear more slender in dry weather. The incubation period depends upon temperature and weather. It may be shortened by hot, rainy weather, with absence of the oil spots. The form and size of the latter also show a relation to the age of the leaves. At 6 to 8° C. the conidia are said to retain their vitality for from 3 to 8 weeks. Infection occurs more readily on the lower surface of the leaf. The receptivity to infection bears some relation to substomatal vapor tension, to cell turgor, and to chemical composition of the cell sap. Rain, fog, and dew favor infection.

A classified bibliography is given.

Studies on grape downy mildew, G. DE ISTVÁNEFFI and G. PÁLINKÁS (*Rev. Vit.*, 40 (1913), Nos. 1036, pp. 481-484; 1037, pp. 509-513; 1038, pp. 540-543).—This is a more detailed discussion than that previously given (E. S. R., 29, p. 350), and deals with the development of *Plasmopara viticola* in the different organs and the utilization of the incubation period for preventive treatment.

Recent researches on grape mildew (*Plasmopara viticola*), G. DE ISTVÁNEFFI and PÁLINKÁS (*Internat. Inst. Agr. [Rome]*, *Mo. Bul. Agr. Intel. and Plant Diseases*, 4 (1913), No. 10, pp. 1651-1655).—This gives briefly the substance of the communications above noted from other sources.

Red scald of grapes, II, H. MÜLLER-THURGAU (*Centbl. Bakt. [etc.]*, 2. Abt., 38 (1913), No. 21-25, pp. 586-621, pl. 1).—Reporting further studies (E. S. R., 28, p. 55) on *Pseudopeziza tracheiphila*, the cause of red scald of grape leaves, the author states that the fungus can live through the winter in dead leaves and develop therefrom in the spring. It probably does not invade the shoots, but the hyphæ enter the leaf from either side during periods of moderate dryness and follow the vascular bundles. The author recommends as preventive or remedial measures the destruction of fallen or diseased leaves, improvement in physical conditions and fertility of the soil, the planting of resistant varieties, and spraying with Bordeaux mixture.

Some diseases of pecans, F. V. RAND (*U. S. Dept. Agr., Jour. Agr. Research*, 1 (1914), No. 4, pp. 303-338, pls. 5, figs. 8).—A number of the more common diseases of the pecan are described. Among these, nursery blight, due to *Phyllosticta caryæ*, is said to be a serious disease of young trees but seldom found in producing orchards. Brown leaf spot, caused by *Cercospora fusca*, is widely

distributed, but, except during wet seasons, causes very little injury. Pecan anthracnose, due to *Glomerella cingulata*, is extensively distributed, but has not proved a very serious pest in any locality. Kernel spot, due to *Coniothyrium caryogenum* n. sp., is said to be rare, and the investigations on this disease thus far have been confined to laboratory and greenhouse work. A technical description of the fungus is given. Crown gall, caused by *Bacterium tumefaciens*, is reported as having been found on pecans in northern Florida and southern Mississippi.

Observations on rust of mallows, L. BLARINGHEM (*Bul. Soc. Bot. France*, 59 (1912), No. 8, pp. 765-773; *abs. in Mycol. Centbl.*, 3 (1913), No. 3, p. 125).—The author concludes from his observations that the development of *Puccinia malvacearum* on *Althaea rosea* and on *A. officinalis* is favored by dryness and light, the latter species being the more sensitive to the action of the parasite.

The influence exerted by rusts on respiration and chlorophyll assimilation by leaves, G. NICOLAS (*Rev. Gén. Bot.*, 25 (1913), No. 297, pp. 385-395).—A comparison of assimilation and respiration in rusted and in rust free leaves of olive, ash, and several other trees is held to show that rusts hinder both these processes.

A twig blight of *Quercus prinus* and related species, DELLA E. INGRAM (*U. S. Dept. Agr., Jour. Agr. Research*, 1 (1914), No. 4, pp. 339-346, pl. 1, figs. 7).—The author describes a disease of the chestnut oak (*Q. prinus*) which, while primarily a disease of this species, is said to be occasionally found on the American chestnut and the white oak.

The fungus causing the disease is referred to *Diplodia longispora*. It is said that large trees are not killed outright, but that they may eventually die as a result of the weakened condition caused by losing the young branches. The saplings are often killed outright.

Infection takes place through wounds in the bark, and the fungus has not been found present in leaf tissues.

A preliminary account of this disease, where it is attributed to *Dothiorella quercina*, has been noted elsewhere (*E. S. R.*, 27, p. 654).

Withertip of fir, T. LAGERBERG (*Skogsvårdsför. Tidskr., Fackaf.*, 1913, No. 3, pp. 173-208, figs. 19; *abs. in Riv. Patol. Veg.*, 6 (1913), No. 7, pp. 213, 214).—A withertip fungus on fir, causing extensive loss in Sweden, has been studied with the result that the organism is declared to be a form of that known as *Brunchorstia destruens*, the name *Crumenula abietina* n. sp. being applied by the author.

An undescribed species of *Gymnosporangium* from Japan, W. H. LONG (*U. S. Dept. Agr., Jour. Agr. Research*, 1 (1914), No. 4, pp. 353-356).—In a previous publication by Clinton (*E. S. R.*, 29, p. 547) attention was called to the introduction of *G. japonicum* on *Juniperus chinensis*. A study of some of the material has led the author to the conclusion that the rust on the woody stems is this species, but that occurring on the leaves or young twigs differs materially, and this is described as *G. chinensis* n. sp.

A leaf disease of Para rubber, C. K. BANCROFT (*Jour. Bd. Agr. Brit. Guiana*, 7 (1913), No. 1, pp. 37, 38).—A new but as yet not very abundant fungus is reported as parasitic on leaves of *Hevea* on a farm in British Guiana. Spots form, increase in size, and finally die and drop out, leaving a hole in the leaf. The fungus was declared at the Kew gardens to be new and was named by Masee *Passalora heveæ*. A trial of lime-sulphur mixture is recommended, also the destruction of affected leaves before transplanting.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Guide to the study of animal ecology, C. C. ADAMS (*New York, 1913, pp. XII+183, pls. 7*).—In the preparation of this work, which indicates briefly some of the general bearings of the subject and method of approach, the author has kept in mind the needs of the beginner in ecology.

The subject is dealt with under the headings of aim, content, and point of view; the value and method of ecological surveys; field study, the collection, preservation, and determination of specimens; references to scientific technique; references to important sources of information on the life histories and habits of insects and allied invertebrates; the laws of environmental change; the laws of orderly sequence or metabolism, growth, development, physiological conditions, and behavior; and the continuous process of adjustment between the environment and the animal, with special reference to other organisms.

Bibliographies are given for the several subjects and author and subject indexes are included.

The birds of Connecticut, J. H. SAGE and L. B. BISHOP (*Conn. State Geol. and Nat. Hist. Survey Bul. 20, 1913, pp. 370*).—In the preparation of the first part of this work (pp. 15-257), which consists (1) of a catalogue of the birds of Connecticut with records of their occurrence within the State, (2) a statistical summary, (3) a list of observers referred to by initials or by surnames, and (4) a bibliography of 58 pages of the important books and articles, the authors were assisted by W. P. Bliss. The second part (pp. 259-360), which is by L. B. Bishop, deals with economic ornithology. An index is included.

The economic importance of the Hungarian partridge (*Perdix perdix*) (*Aquila, 19 (1912), No. 1-4, pp. 166-209*).—The first part of this paper (pp. 166-201), which is by L. Thaisz, relates to the vegetable food, and the second part (pp. 202-209), by E. Csiki, to the insect food of the Hungarian or gray partridge, a species which has been introduced into the United States, as previously noted (*E. S. R., 23, p. 154*).

Examination of contents of stomachs and crops of Australian birds, J. B. CLELAND (*Emu, 11 (1911), No. 2, pp. 79-95*).—Previously noted from another source (*E. S. R., 29, p. 756*).

Fifth annual report of the Quebec Society for the Protection of Plants from Insects and Fungus Diseases, 1912-13 (*Ann. Rpt. Quebec Soc. Protec. Plants [etc.], 5 (1912-13), pp. 95, figs. 46*).—Among the more important entomological papers in this report are the following: Parasitic Insects in the Control of Injurious Forms, by W. Lochhead (pp. 12-23); The Sawflies of the Province of Quebec, by T. W. Fyles (pp. 27-31); The Rôle Played by Bees in Fertilization of Flowers, by F. W. L. Sladen (pp. 39, 40); Some Insects which Attack the Roots of Vegetables, by A. Gibson (pp. 41, 42); Some Insect Enemies of Shade Trees, by J. M. Swaine (pp. 43-58); An Old Enemy of the Potato [*Meloidæ*], by J. C. Chapais (pp. 72-75); and Concerning Cutworms, Wireworms, and White Grubs, by W. Lochhead (pp. 85-94).

Injurious insects in Brazil, G. BONDAR (*Bol. Agr. [Sao Paulo], 14. ser., 1913, No. 1, pp. 28-42, figs. 16*).—This is a general account of important insect enemies of the common fig (*Ficus carica*) and of a related wild form in Brazil. Special mention is made of the injury caused by the buprestid borer *Colobogaster quadridentata*; the cerambycid borers *Taniotes scalaris* and *Trachyderes thoracicus*; the curculionid *Heilipus bonelli*, which bores in the trunks; the pyralid *Azochis gripusalis*, which bores in the limbs; the sphingid *Pachylia ficus*; and the coccid *Morganella maskelli*.

A further contribution to the knowledge of the enemies of the olive, G. DEL GUERCIO (*Redia, 9 (1913), No. 1, pp. 59-75; abs. in Rev. Appl. Ent., 1 (1913),*

Scr. A, No. 10, pp. 390, 391).—The notes here presented relate to the olive lecanium (*Lecanium oleæ*), the leopard moth (*Zeuzera pyrina*), the olive tineid (*Prays oleellus*), the olive psylla (*Euphyllura olivina*), and the scolytid *Hylesinus oleiperda*.

The natural enemies of vineyard pests, J. FEYTAUD (*Rev. Vit.*, 39 (1913), Nos. 994, pp. 5-9, pl. 1; 995, pp. 36-40, figs. 2; 996, pp. 76-81, figs. 2; 997, pp. 97-101, figs. 3; 998, pp. 137-141, figs. 2).—The first portion (pp. 5-9, 36-40) of this paper deals with the more important insect predators; the second (pp. 76-81, 97-101, 137-141) with insect parasites.

Insect enemies of the elm in France, F. PICARD (*Prog. Agr. et Vit. (Ed. l'Est-Centre)*, 34 (1913), No. 49, pp. 712-719, pl. 1).—In this account the author deals with the elm leaf beetle (*Galerucella luteola*), the elm scolytid (*Scolytus destructor*), the small scolytid of the elm (*S. pygmaeus*), the elm anthaxia (*Anthaxia manca*), the copper buprestid (*Pæcilonota decipiens*), the elm sawyer (*Saperda punctata*), the elm necydale (*Necydalis ulmi*), and the goat moth (*Cossus ligniperda*).

The sanitary pathological importance of insects and related arthropods, E. A. GÖLDI (*Die sanitärisch-pathologische Bedeutung der Insekten und verwandten Gliedertiere, namentlich als Krankheits-Erreger und Krankheits-Überträger*. Berlin, 1913, pp. 155, figs. 178).—The first part of this work relates to stinging, biting, and irritating insects and arthropods (pp. 9-28); the second part to bloodsucking insects and other arthropods (pp. 28-122); and the third to insects and other arthropods as disease transmitters (pp. 122-151). A subject index is appended.

Powdered arsenate of lead as an insecticide, W. E. HINDS (*Jour. Econ. Ent.*, 6 (1913), No. 6, pp. 477-479).—The author states that he has yet to hear of a single instance in which dry powdered arsenate of lead caused the formation of a sore upon either man or beast when engaged in its application, or of a single case of internal poisoning resulting from its extensive use. "At the present time we know of no reason why anyone should hesitate to use powdered arsenate of lead in preference to Paris green or any other arsenical poison now commonly obtainable upon the market."

Catalogue of palearctic Hemiptera (Heteroptera, Homoptera-Auchenorrhyncha, and Psylloideæ), B. OSHANIN (*Katalog der paläarktischen Hemipteren*. Berlin, 1912, pp. XVI+187).—This catalogue lists more than 5,369 species. It includes indexes (1) to the species and varieties, and (2) to the subgenera, genera, and higher groups.

On fungi parasitic on scale insects found in Formosa, K. MIYABE and K. SAWADA (*Jour. Col. Agr. Tohoku Imp. Univ.*, 5 (1913), No. 3, pp. 73-90, pls. 2; *abs. in Agr. News [Barbados]*, 12 (1913), No. 299, p. 334).—This paper deals with 7 species of fungi found to be parasitic on scale insects in Formosa, namely, *Aschersonia aleyrodes* and *Ophionectria tetraspora* n. sp., parasitic on *Parlatoria zizyphi* infesting *Citrus nobilis*; *A. marginata*, parasitic on *Coccus longulus* and *P. zizyphi* infesting *Citrus nobilis* and *Psidium guajava*; *A. suzukii* n. sp., parasitic on *Coccus longulus* infesting the living leaves and branches of *Citrus nobilis* and *Fagara nitida*; *Sphaerostilbe coccophila*, parasitic on *P. zizyphi*, *Mytilaspis gloverii*, and *Aspidiotus ficus* infesting *Citrus nobilis*, *Ficus wightiana*, and *Thea chinensis*; *Microcera fujikuroi* n. sp. on *Aspidiotus ficus* infesting *Citrus nobilis*, and commonly found throughout the island of Formosa, often associated with *Microcera coccophila*; and *O. coccicola*, parasitic on *P. zizyphi*, *Aspidiotus ficus*, *Mytilaspis gloverii*, and *M. citricola* infesting *Citrus nobilis*.

It is stated that some species are not recorded in the present paper because of the imperfect condition of the specimens and that these will be treated in a future paper, together with fungi parasitic on scale insects found in other parts of Japan. A list of the papers referred to is appended.

On the development of the eggs of *Bombyx* (*Sericaria*) *mori* the first month after deposition, M. RIZZI (*Redia*, 8 (1912), No. 2, pp. 323-359, pls. 4).—The report of an embryological study of the silkworm, with a bibliography of 17 titles.

Control of army worm and cotton caterpillar, E. L. WORSHAM (*Ga. Bd. Ent. Bul.* 36, 1912, pp. 8, figs. 5).—A popular account.

The wilt disease of gipsy moth caterpillars, R. W. GLASER and J. W. CHAPMAN (*Jour. Econ. Ent.*, 6 (1913), No. 6, pp. 479-488).—The authors' experiments and observations are summarized as follows:

"The presence of polyhedral bodies in the blood corpuscles may be useful in diagnosing the health of nun moth caterpillars, but this test can not be used for gipsy moth caterpillars with any degree of certainty. The virus of wilt disease is filterable with difficulty. Such a filtrate is free from bacteria and polyhedral bodies. Caterpillars dead from the infection with the filtered virus are flaccid, completely disintegrated, and full of polyhedral bodies. Usually the complete absence of bacteria immediately after death is very striking as cultures and smears show. Minute dancing granules were observed in the diseased tissue cells with very high powers. These same granules were also noticed in the Berkefeld filtrate. There is no evidence that polyhedral bodies are stages of the filterable virus. A large number of caterpillars used in the experiments died, due to disturbances in their normal physiological activities. There is no evidence that the wind is an important factor in distributing the disease. Infection naturally takes place through the mouth by means of the food. Apparent immunity is a striking phenomenon."

A bibliography of 17 titles is appended. See also a previous note (E. S. R., 27, p. 660).

Notes on a chestnut tree insect, A. G. RUGGLES (*Science*, n. ser., 38 (1913), No. 989, p. 852).—These notes relate to an undetermined lepidopteran which is referred to as the "bast miner" because of the habit of the larvæ of burrowing in the bark of the chestnut tree, particularly in smooth-barked trees. The larvæ hibernate in the burrows in either the second or third instar. The burrow, which extends longitudinally, is not very extensive, the longest not being more than 6 in.; it can not be detected externally while the borer is within the bark, but after the emergence of the larvæ the bark swells over the burrow, often cracking and making a conspicuous wound. The larvæ leave the trees during the first part of June through minute exit holes and drop to the soil, in which they spin a seed-pod-like cocoon. Under insectary conditions the adult insect emerges during August.

Since the number of exit holes made by these larvæ is enormous in any given area of chestnut forest and as these holes are made just at the time of the year when the blight spores are very abundant and conditions generally are favorable to their development, it is thought that this insect has an important bearing upon the spread of *Endothia parasitica*.

A list of mosquitoes hitherto reported from New Orleans, C. WELLMAN and H. D. KING (*Amer. Jour. Trop. Diseases and Prev. Med.*, 1 (1913), No. 4, pp. 267-280).—Twenty species representing 9 genera are recorded in this paper, which is said to be preliminary to a systematic mosquito survey of the city and environs of New Orleans, planned for the spring and summer of 1914. References to the medical and zoological literature which has been searched

with the object of recording previous work on New Orleans mosquitoes are appended.

Life history of syrphid fly predaceous on froghopper nymphs, P. L. GUPPY (Dept. Agr. Trinidad and Tobago Bul., 12 (1913), No. 75, pp. 159-161, figs. 3; Dept. Agr. Trinidad and Tobago Spec. Circ. 8, 1913, pp. 5, figs. 3).—The syrphid fly here dealt with, the name of which is omitted, is said to be the most important enemy of the froghopper, and an attempt will be made to breed it on a large scale. It has been found by dissection that the ovaries contain upwards of 350 eggs and that there are 30 egg tubes in each ovary and 6 eggs in each tube. From 30 to 40 nymphs are killed during the life of the maggot, which is from 9 to 10 days' duration, and there is no doubt but that it destroys numbers of very small nymphs wherever these are abundant. The egg was found to require $2\frac{1}{2}$ days for its development, the larva 9 to 10 days, and the pupa 9 days.

Recommendations for dealing with the froghopper, J. C. KERSHAW (Dept. Agr. Trinidad and Tobago Spec. Circ. 9, 1913, pp. 10).—This circular includes a brief discussion of syrphus fly [*Salpingogaster nigra*] above noted; manner of dealing with trash; use of trap lights, a summary of recommendations; and miscellaneous notes.

A new botfly from reindeer, F. KNAB (Proc. Biol. Soc. Wash., 26 (1913), pp. 155, 156).—Under the name *Oedemagena terranova* the author describes a second species of botfly which infests the reindeer (*Rangifer terranova*) peculiar to Newfoundland. This is the second species of the genus of which *O. tarandi*, the first, was described in 1736 from Lapland. *O. tarandi* has frequently been reported from northern localities of the Old World and a number of times from the boreal regions of North America, including Alaska.

The geographical distribution of the stable fly, *Stomoxys calcitrans*, C. T. BRUES (Jour. Econ. Ent., 6 (1913), No. 6, pp. 459-477).—"The stable fly (*S. calcitrans*) is one of the most widely distributed insects, rivaling the house fly in this respect. It occurs commonly in parts of every zoological region and practically throughout most of them. It is probably native to the palearctic region from whence it has followed man in his migrations to all parts of the world. In the United States it was common in the vicinity of Philadelphia as early as 1776. It is not equally abundant everywhere that it occurs, but is much more common in temperate regions such as the United States and Argentina. In the Tropics it occurs very generally, but almost always in lesser numbers than in cooler climates."

The domestic fly (*Muscina stabulans*), an enemy of man and his household, and, in the larval stage, of the larvæ of the house fly, I. A. PORTCHINSKY (Trudy Bûro Ent. [St. Petersburg.], 10 (1913), No. 1, pp. 39, figs. 32; abs. in Rev. Appl. Ent., 1 (1913), Ser. B, No. 6, pp. 108-110).—It is stated that the second stage larvæ of this species attack the larvæ of the house fly and very soon exterminate all that happen to be living nearby. The larvæ also destroy the larvæ of *Hydrotæa dentipes*, which species is also carnivorous and destroys the larvæ of the house fly. The larvæ of *Polyctes albolineata*, however, are always victorious over those of *M. stabulans*, even when the latter are larger. Another species of the genus, *M. pabulorum*, is an important enemy of the larvæ of *Sciara militaris*. The author has never observed the larvæ of *M. stabulans* eating each other, as is the case with some other larvæ (*P. albolineata*). In his opinion the harm done by *M. stabulans* in destroying the larvæ of a useful fly such as *H. dentipes* outweighs its utility as a destroyer of the larvæ of the house fly.

"The author gives a detailed description of *M. stabulans* and of its habits, and points out at length the differences between the eggs of this fly and those of *Musca domestica*, as well as of two other flies commonly found in human dwellings, *Calliphora erythrocephala* and *Fannia canicularis*, all of the eggs being figured. *M. stabulans* may lay as many as 160 small eggs, spreading them singly or in lines over the whole surface of the object on which they are laid, which makes them more difficult to recognize than those of other flies. . . . The author confirms the statement of Bouché that this fly is able to go through all its transformations in about a month, thus being able to produce several generations during the summer."

Narcissus flies, R. S. MACDOUGALL (*Jour. Bd. Agr. [London], 20 (1913), No. 7, pp. 594-599, figs. 2*).—This paper relates to the large narcissus bulb fly (*Merodon equestris*) and *Eumerus strigatus*.

Notes on the bean fly (*Agromyza phaseoli*), E. JARVIS (*Queensland Agr. Jour., 30 (1913), No. 3, pp. 192-195, figs. 2*).—This troublesome pest (E. S. R., 29, p. 657), is said to be on the increase and slowly but surely extending its range both in Queensland and New South Wales.

Biological studies of the auchmeromyids, E. ROUBAUD (*Bul. Soc. Path. Exot., 6 (1913), No. 2, pp. 128-130*).—The adults of these flies are said to be coprophagous and the larvæ exclusively hematophagous.

Studies of the auchmeromyids; calliphorine flies with bloodsucking larvæ occurring in tropical Africa, E. ROUBAUD (*Bul. Sci. France et Belg., 47 (1913), No. 2, pp. 105-202, pls. 2, figs. 32; abs. in Rev. Appl. Ent., 1 (1913), Ser. B, No. 10, pp. 172-175*).—This paper deals at length with (1) the classification (pp. 109-128) and (2) the biology and organization of Diptera of the genera *Chæromyia* and *Auchmeromyia*.

A bibliography of 30 titles is appended.

Studies of the Diptera with internal entomophagous larvæ, II, J. PANTEL (*Cellule, 29 (1913), No. 1, pp. 289, pls. 7, figs. 26*).—The first section (pp. 8-114) of the second part of this work (E. S. R., 23, p. 562) relates to the egg envelopes (vitelline membrane and chorion) and their dependents; the second section (pp. 115-252) to indirect injury from parasitism.

The indirect injury due to parasites is taken up under the headings of (1) indirect injury not affecting the reproductive function; (2) indirect injury of the reproductive function, indirect parasitic castration; (3) is parasitic castration a phenomenon "sui generis"?—nonparasitic alterations of the female gonad in various insects.

The literature relating to these subjects is reviewed in connection with a bibliography of 8 pages.

A catalogue of Coleoptera (*Coleopterorum Catalogus. Berlin, 1912, pts. 48, pp. 92; 49, pp. 135-290; 50, pp. 291-450; 51, pp. 103; 52, pp. 108; 53, pp. 278; 54, pp. 29; 55, pp. 74*).—In continuation of this work (E. S. R., 28, p. 256) part 48, by M. Pic catalogues the Anobiidæ; parts 49 and 50, by K. W. von Dalla Torre, the subfamily Melolonthinæ III and IV of the Scarabæidæ; part 51, by H. Clavareau, the subfamilies Sagrinæ, Donaciinæ, Orsodacninæ, and Criocerinæ of the Chrysomelidæ; part 52, by A. Lameere, the subfamily Prioninæ of the Cerambycidæ; part 53, by H. Clavareau, the subfamilies Megascelinæ, Megalopodinæ, Clytrina, Cryptocephalina, Chlamydina, and Lamprosominæ of the Chrysomelidæ; part 54, by E. Csiki, the Rhipiphoridæ; and part 55, by M. Pic, the Bruchidæ.

The grape flea beetle in France, F. PICARD (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 34 (1913), No. 5, pp. 139-145, pl. 1*).—A brief account of *Haltica ampelophaga*, including its natural enemies and remedial measures.

The natural enemies mentioned include the predatory bug *Zicrona carulea*, a braconid parasite of the larva (*Perilitus brevicollis*), a tachinid parasite of the adult (*Degeeria funebris*) which some years parasitizes 85 per cent of the flea beetles and in an indirect manner prevents their reproduction, and the fungus *Beauveria* (*Sporotrichum*) *globuliferum*.

Notes on Podabrus pruinus, H. F. WILSON (*Jour. Econ. Ent.*, 6 (1913), No. 6, pp. 457-459, fig. 1).—This beetle is said to have been abundant in the Willamette Valley in Oregon during the past two years and one of the most important agencies in the control of all forms of plant lice, the rosy apple aphid (*Aphis sorbi*), the black cherry aphid (*Myzus cerasi*), and the vetch aphid (*Macrosiphum pisi*) being the principal species held in check. The beetle crushes the aphids with its mandibles and extracts the juices.

The rhinoceros beetle (*Oryctes rhinoceros*) in Samoa, R. W. DOANE (*Jour. Econ. Ent.*, 6 (1913), No. 6, pp. 437-442, pls. 2).—This is a report of studies made by the author in Samoa during May, June, and July, 1913.

New potato weevils from Andean South America, W. D. PIERCE (*U. S. Dept. Agr., Jour. Agr. Research*, 1 (1914), No. 4, pp. 347-352, pls. 3, figs. 3).—A number of shipments of South American potatoes during the year 1913 for experimental propagation by this Department have been found infested with live weevils. As a result the Federal Horticultural Board has excluded South American potatoes from the United States. The author has made a study and here presents information upon the weevils concerned with a view to assisting the inspectors in their work.

The three species thus far found are said to be very different in appearance. An account of one of the weevils, namely, *Rhigopsidius tucumanus*, received in potatoes from Peru, Bolivia, and Chili, has previously been noted (E. S. R., 29, p. 761). The two additional weevils each represent a new genus and species and are here described as *Premnotrypes solani* and *Trypopremnon latithorax*. *P. solani* was found alive in a potato sent from the mountain districts of Peru, the adult weevil having been found just beneath the skin of the potato in a small cell which evidently served as a feeding cell for the larva. The material received indicates that the larva does not bore extensively in the potato. Several specimens of *T. latithorax* were found in cells in potatoes received from Cuzco, Peru, the species developing in a manner closely resembling that of *P. solani*. *R. tucumanus* appears to be more widely distributed and the source of greater injury than either of the other two species.

The pathogenicity of Nosema apis to insects other than hive bees, H. B. FANTHAM and ANNIE PORTER (*Ann. Trop. Med. and Par.*, 7 (1913), No. 4, pp. 569-579).—"N. apis has been proved pathogenic to Hymenoptera other than bees. It can multiply in the food canals of humble bees, mason bees, and wasps, and can bring about the deaths of the hosts. Contamination of plants with infected excrement occurs in the neighborhood of badly infected hives. Such contaminated food is pathogenic to the larvæ of cabbage white butterflies, cinnabar moths, and gooseberry moths, in which *N. apis* produces destruction of the tissue of the food canal in the same way as in bees. Both imagines and larvæ of these insects became infected with microsporidiosis when supplied with food contaminated with *Nosema* spores.

"*Calliphora erythrocephala*, the blow fly, becomes infected naturally by ingesting *Nosema* spores contained in the sweet excrement of bees. This infection has been repeated experimentally. Crane flies may also become infected.

"A member of the Hippoboscidae, *Melophagus ovinus*, has been infected successfully with *N. apis*, which is pathogenic to the sheep ked. It is suggested

that research be made by competent observers among the Glossinæ for microsporidian parasites allied to the Nosema of bees, and, possibly, equally pathogenic to the tsetse flies that may harbor them."

The evolution and larval forms of *Diachasma crawfordi* n. sp., D. KEILIN and C. PICADO (*Bul. Sci. France and Belg.*, 47 (1913), No. 2, pp. 203-214, pl. 1, figs. 4).—The braconid parasite of the fruit fly *Anastrepha striata* here described as new was discovered by the authors while conducting studies in Paris of material brought from Orosi, Costa Rica, where this fly highly infests the guava (*Psidium*). It is thought that this may be the same as the parasite collected by Crawford (E. S. R., 25, p. 56) in Mexico, and which, apparently unknown to the present authors, was described by Viereck (E. S. R., 26, p. 352) as *D. crawfordi*. Some 10 per cent of fruit fly larvæ were found to be parasitized. It is stated that *Biosteres brasiliensis* and *B. areolatus* have been reared from pupæ of *A. fraterculus* from Brazil.

The brown-tail and gipsy moths and parasites, E. E. PHILBROOK (*Bul. [Maine] Dept. Agr.*, 12 (1913), No. 4, pp. 18, pls. 11).—A detailed discussion of these pests with an account on Parasite Introduction into Maine, by A. M. G. Soule (pp. 10-18).

Hereditary infection, with special reference to its occurrence in *Hyalomma ægyptium* infected with *Crithidia hyalommmæ*, W. R. O'FARRELL (*Ann. Trop. Med. and Par.*, 7 (1913), No. 4, pp. 545-562, pls. 3).—"C. *hyalommmæ* is a flagellate parasite occurring in the hæmocœlic fluid, salivary glands, ovary, oviducts and ova of *H. ægyptium*, the common cattle tick of the Anglo-Egyptian Sudan. The parasite has 4 periods in its life cycle, a preflagellate stage passed chiefly in the hæmocœlic fluid, a flagellate stage in the hæmocœlic fluid and in the ovary and oviducts, a postflagellate stage in the hæmocœlic fluid, and a post-flagellate or ovarian stage in the ovary and oviducts, ovarian cells, and ova. . .

"Multiplication of *C. hyalommmæ* by longitudinal division takes place in all its stages. Infection of *H. ægyptium* by *C. hyalommmæ* in the adult is purely a hereditary infection. The flagellate is a strictly parasitic flagellate of the tick, and is nonpathogenic to the tick host."

FOODS—HUMAN NUTRITION.

The chemical milling and baking value of Utah wheats, R. STEWART and C. T. HIRST (*Utah Sta. Bul.* 125, pp. 115-150).—Additional data are reported regarding the studies of Utah wheats which have been carried on (E. S. R., 25, p. 263). The necessity for standardizing western grains is insisted upon and the details given of studies of 1907-1909 spring wheats and winter wheats grown under dry-farming conditions and of irrigated wheats.

The authors summarize the data regarding the yield and composition of the milling products, the composition of the flours, and the bread making qualities of these wheats as follows:

"The weight per 100 kernels of the irrigated wheat is greater than that of either the spring or winter dry-farming wheat. The yield of flour, bran, and shorts shows nothing characteristic. . .

"Nothing characteristic is shown with respect to the moisture content except that it is low in every case. The protein content of irrigated wheat is lower than that of either the spring or winter dry-farm wheat. The spring wheat contains the highest protein content. The bran and shorts produced from the irrigated wheat have a lower protein content than that produced from dry-farm wheat. . .

"The flour produced from the winter dry-farm wheat has a slightly lower moisture content than the flour produced from the other kinds of wheat. The

protein content of the flour produced from the wheat receiving the greatest amount of irrigation water is 3.11 per cent lower than that produced from spring dry-farm wheat and 2.01 per cent lower than that produced from dry-farm winter wheat. In case of the irrigated varieties of wheat, as the amount of water applied decreases the protein content increases. The protein content of the flour produced from wheat which received no irrigation water is 1 per cent greater than that produced from wheat receiving an application of 25 in., notwithstanding the fact that the seed wheat in both cases was the same and the nonirrigated wheat was grown on land which had been irrigated in previous years. The moist-and-dry gluten content of the flour produced from the irrigated wheat is considerably lower than that produced from either spring or winter dry-farm wheat. . . .

"Nothing characteristic of the several kinds of wheat is shown with respect to the volume of water added or retained. The ratio of protein to volume of water added is narrower in case of the dry-farm grains. The volume of loaf made from dry-farm flour is slightly greater than that produced from irrigated flour. The ratio of protein to volume of loaf is narrower in the dry-farm flour than in the irrigated flour.

"The investigations extending over a period of 8 years clearly demonstrate the fact that the dry-farm grains in Utah are characterized by a low moisture content and a high protein content. They also clearly indicate that the protein content of the dry-farm wheats is higher than the protein content of the wheat on irrigated farms."

Studies in carbohydrates—the composition and digestibility of wheat bread and allied foods [and] gelatinization of starches. C. H. LAWALL and SARA S. GRAVES (*Trans. Wagner Free Inst. Sci. Phila.*, 7 (1913), pt. 2, pp. 35-45).—The results are reported of the microscopic examination of 12 starches, raw and cooked below and at the temperature of boiling water, including starches from cereals, potatoes, sweet potatoes, maranta, beans, and peas. In the cooked starches, "it was noticed that the absorption of water begins at the hilum, working toward the edge until the granules burst or collapse."

Similar studies were made of the starch of white bread, commercial rye, graham, and gluten breads, rolls and crackers, pretzels, and matzoth, and of the starch in cooked vegetables, including beans, peas, and lentils, boiled until soft, baked beans, string beans, and canned French peas (*petits pois*). With the vegetables, "in every case the starch granules were found to be entirely gelatinized, either swollen or broken."

Determinations of the gelatinization points of free starches from cereals, potatoes, sweet potatoes, maranta, beans, peas, and lentils were also made. "Noting the gelatinization points of raw and dried potato starch, and the diverse results in the pea and bean experiments, it is evident that the form of the starch and size of the particles have marked influence. It is possible that the time required to heat to the desired point may affect the result. The greatest difficulty, however, lies in determining the point at which the majority of the granules may be called gelatinized. It is not definite within 1 to 3°.

"As a means of distinguishing starches in a mixture the method appears useless, especially with the small granule starches, such as wheat and rye, in which the refraction is at all times very faint."

The authors investigated the composition, including acidity and condition of carbohydrates, in 5 samples of commercial bread, in homemade bread, and in crackers, pretzels, and matzoth.

"The microscopic examination of starch, both raw and after cooking, has shown that in process of bread making it undergoes a marked change which has a direct effect on the composition and value of the bread produced. From 5 to

8 per cent of the insoluble starch is changed to a soluble form, and very many grains are ruptured and rendered more susceptible to the action of solvents, such as the digestive fluids, by combined action of heat and ferments. The 35 to 40 per cent of water prevents the temperature in the interior of the loaf from rising much above 100°, thus accounting for the small amount of soluble starch in comparison with the 10 to 18 per cent in bread crust and 5 to 12 per cent in crackers.

"With the modern process of bread making on the large scale it is evident that differences in methods or in constituents make only a very slight difference in products, and that claims of superiority, other than on the basis of taste, are untenable."

Salt in bread making, O. J. FREED (*Oper. Miller*, 18 (1913), No. 12, pp. 794-797, figs. 9).—The results of experiments are given on the effects of salt, not to exceed 3½ lbs. per barrel of flour (196 lbs.), upon the yield and quality of bread. The author's conclusions in the main were as follows:

With an increase of salt, the color was improved, the texture and grain were greatly benefited, the volume or size was increased, and the crust of the bread was softened. The more salt the longer it takes the dough to rise, and the less salt, the faster the dough rises.

"When all these points are taken into consideration, we are forced to the conclusion that the safest amount of salt for [white] bread . . . is 3 lbs. to a barrel. . . . Any amount above this, say 3½ lbs., will not only work to retard the fermentation, but will also impair the quality. A bread that has no salt, or insufficient salt, is tasteless and insipid. The salt will retard the fermentation only when it is used in excessive amounts."

In the author's opinion, in extremely hot weather ½ lb. more salt is beneficial, while in the winter time it is desirable to decrease the amount ½ lb. and raise the temperature of the dough to 86° F. In working with hard water less salt is needed than when using soft water.

A new method of handling preserved foods and its value for army and navy use, J. R. KATZ (*Umschau*, 17 (1913), No. 47, pp. 975-978).—The use of pulp or paper containers for sterilized foods is described, a method devised by Miss M. Rutten.

Report of Missouri Home Makers' Conference Association, 1913 (*Missouri Bd. Agr. Mo. Bul.*, 11 (1913), No. 3, pp. 130, figs. 41; *Ann. Rpt. Missouri Bd. Agr.*, 45 (1912), pp. 149-275, figs. 41).—The report contains a number of papers presented, including, among others, The Feeding of Children, [with Menus], by Amy L. Daniels; Hot Lunches in Rural School, by Mrs. Fannie Quick; Teaching Cooking in the Fruitville Rural School, by Helen Swift; The Short Course for Women in the University of Missouri, by Louise Stanley; A Lesson in Drafting Patterns, by Nelle Carter; Art and Hand Work in Rural Schools, by Ella V. Dobbs; School Sanitation, by Louise Stanley; How to Make a Garden Serve the Table the Whole Year, by Mrs. S. W. Ravenel; Farm Home Management, by O. R. Johnson; Farm Home Management, by Mrs. J. E. Hall; Salt-rising Bread, by Winona Woodward; and An International Movement for the Betterment of Rural Homes, by Maude M. Griffith.

Household discoveries and Mrs. Curtis's cook book, S. MORSE and ISABEL G. CURTIS (*Petersburg, N. Y.*, 1913, rev. ed., pp. XXII+33-1173, pls. 6, figs. 247).—Data regarding the care of the home and its equipment, insect pests, and other matters of interest to the housekeeper are presented, the material being arranged in encyclopedic form. A large number of recipes and discussions of food problems are included. Material published by the U. S. Department of Agriculture has been freely drawn upon.

Nutrition and diet, EMMA CONLEY (*New York, Cincinnati, and Chicago, 1913*, pp. 208, pls. 8, figs. 11).—This volume, designed as a text-book for secondary schools, deals with the composition of the human body and of foods and their classification, digestion, the balanced meal, planning of meals, and similar topics, and has chapters on the principal groups of foods. In a number of instances the form of statement might be modified with advantage.

The history of dietetics, J. B. NICHOLS (*Pop. Sci. Mo.*, 83 (1913), No. 5, pp. 417-427).—In this summary and digest of data the author has brought together a large amount of information regarding the experimental study of this subject.

Food and labor, J. AIKEN (*Timchri, Brit. Guiana*, 3. ser., 2 (1912), No. 2, pp. 287-291).—Data are presented and discussed regarding the cost of food of laborers in British Guiana.

Concerning the food of agricultural laborers, MRS. MARGARETE KLÜPPER (*Ztschr. Landw. Kammer Schlesien*, 17 (1913), No. 44, pp. 1629-1632).—The need for considering information regarding the preparation of food is pointed out and a number of recipes given for dishes deemed particularly suitable for rural regions.

The enzymic action of fresh foods and condiments, T. TADOKORO (*Jour. Col. Agr. Tohoku Imp. Univ.*, 5 (1913), No. 2, pp. 57-72).—The carefully expressed juice of udo sprouts, yam tubers, cabbage and lettuce leaves, cucumbers, onions, ginger, and horse-radish roots was used in these experiments.

The enzymic action was tested in the following manner: Samples of raw and of cooked juices from each vegetable were allowed to stand with solutions of albumin, peptone, glycocoll, asparagin and urea, starch, amygdalin and salicin, and hydrogen peroxid, and with castor oil emulsion; the usual tests for peptase, tryptase, amylase, lipase, etc., were then applied and the difference in the results obtained from the cooked and uncooked samples was taken as the measurement of the enzymic action from each vegetable. Oxidasis was tested by color reactions.

The author summarizes his results as follows: (1) Only ginger and onion showed any noticeable peptolytic power; (2) tryptic action was more or less apparent in all the juices except those from onion and horse-radish and was strongest in that from cabbage; (3) none of the juices caused the liberation of ammonia from glycocoll or asparagin, but small amounts were split off from urea in the case of udo sprouts, yams, and ginger; (4) more or less diastatic activity was noted in every case except onion, being strongest in ginger and moderate in yams, horse-radish, and cabbage; (5) lipolytic action was observable only in cabbage; (6) glucosidases were found only with yams and cabbage; (7) various oxidases appeared in all samples, being most noticeable in ginger and onion; (8) catalytic activity was shown with all samples, being strongest in ginger and onion.

The author hopes soon to report on the special nature and digestive influence of the materials here considered.

Studies on amylases.—VI, A comparison of amyloclastic and saccharogenic powers, H. C. SHERMAN and M. D. SCHLESINGER (*Jour. Amer. Chem. Soc.*, 35 (1913), No. 11, pp. 1784-1790).—A progress report on work previously noted (*E. S. R.*, 24, p. 122) regarding the activity of amylases under different conditions.

Studies on amylases.—VII, The forms of nitrogen in amylase preparations from the pancreas and from malt, as shown by the Van Slyke method, H. C. SHERMAN and A. O. GETTLER (*Jour. Amer. Chem. Soc.*, 35 (1913), No. 11, pp. 1790-1794).—A continuation of the above.

The prolin fraction of the hydrolysis products of casein, F. W. FOREMAN (*Biochem. Ztschr.*, 56 (1913), No. 1-2, pp. 1-10).—Amino butyric acid, not

hitherto identified as a product of protein cleavage, was found in the prolin fraction of casein. An acid substance apparently containing the piperidin ring was also isolated and a base presumably derived from it. Other compounds were present with nitrogen in the form of amino groups. Prolin determined by the Van Slyke method contains these bodies.

The utilization of inulin in diet cures, A. GOUDBERG (*Ztschr. Expt. Path. u. Ther.*, 13 (1913), No. 2, pp. 310-325; *abs. in Zentbl. Expt. Med.*, 4 (1913), No. 11, p. 490).—According to the author, inulin is well digested and utilized in the body. It is not a builder of glycogen.

The total volume of gastric juice secreted during digestion, J. WINTER (*Compt. Rend. Acad. Sci. [Paris]*, 157 (1913), No. 3, pp. 234, 235).—A note on the method of calculating this factor.

The influence of the melting point of nonemulsified fats on the rapidity of their passage out of the stomach, A. VON FEJÉR (*Biochem. Ztschr.*, 53 (1913), No. 1-2, pp. 168-178, fig. 1).—The experiments here reported were similar to those previously reported by Tangl and Erdélyi (*E. S. R.*, 26, p. 159) with fat emulsions and were carried on with laboratory animals (white rats and mice) confined in a respiration calorimeter.

The rapidity with which the nonemulsified fats passed out of the stomach was found to bear a direct relation to the melting point and the degree of viscosity of the fat, higher melting points and greater viscosity accompanying more rapid passage. Nonemulsified fat eaten in combination with ordinary food materials passed out of the stomach more slowly than did the fat emulsions. The rate at which the nonfatty portion of the food left the stomach depended upon the character of the food, the less viscous fat hindering the process less than the viscous.

The fat eaten mixed with other food materials was partially separated from the latter soon after reaching the stomach and passed separately into the intestinal tract.

Concerning the fate of single amino acids, of mixtures of such acids, of peptones, and of proteids introduced into the digestive tract, E. ABDERHALDEN and A. E. LAMPÉ (*Hoppe-Seyler's Ztschr. Physiol. Chem.*, 81 (1912), No. 5-6, pp. 473-507).—This article discusses the development of the method of Abderhalden and Schmidt for detecting amino acids in a dialyzate from blood serum by means of a color reaction with triketohydrindene hydrate (*E. S. R.*, 26, p. 804), and gives the results of tests made with the blood of dogs to which meat, creptone, and Witte's peptone had been administered.

Although recognizing the limitations of this indirect and quantitative method of determining the amino acid content, the authors believe that their work furnishes direct proof that certain amino acids pass from the gastrointestinal tract into the blood.

The importance of the thyro-parathyroid in the assimilation of carbohydrates, U. LOMBEROSO and C. ARTOM (*Arch. Farmacol. Sper. e Sci. Aff.*, 16 (1913), No. 7, pp. 289-298).—The authors gave concentrated solutions of sucrose and invert sugar to laboratory animals (dogs) from which the thyroid and parathyroids had been removed and noted the effect upon the elimination of sugar through the urine.

The animals, which showed the general characteristic morbid effects of the operation, showed also a considerable increase in the percentage of both sugars appearing unoxidized in the urine, the rapidity in the appearance and the extent of the increase corresponding to those of the other symptoms. When the disturbances were slight, the sucrose was eliminated largely in the form of glucose; when more profound, it appeared in the urine as sucrose.

This suggests that the thyro-parathyroid glands may play a rôle in the production of inverting enzymes similar to that generally assigned to the pancreas in the production of erepsin and lactase. There is no reason to assume, however, that this influence of the thyroid is as direct and immediate as that of the pancreas. The contrary is implied by the fact that the elimination of sugar increased in proportion as the general symptoms consequent upon the thyroidectomy became more pronounced.

The significance of pentosans as a source of energy in the animal organism, P. SCHNOKICH (*Biochem. Ztschr.*, 55 (1913), No. 5-6, pp. 370-392).—In the respiration experiments here described, fixed quantities of arabinose or of grape sugar were given to a dog, sometimes in addition to a regular diet and sometimes during fasting.

It was found that both arabinose and grape sugar decreased the oxidation of the animal. The effect of arabinose was much greater than that of grape sugar and was more noticeable when the material was given with a normal diet than during fasting. It was also observed that arabinose did not affect the processes of oxidation immediately after resorption, although from 40 to 50 per cent of the dose was retained in the body. This fact suggests the possible storage of arabinose in combination with other molecules, analogous to the formation of glycogen from the hexoses.

The biological significance of phosphorus to the growing organism.—I, Investigations into the influence of phosphorus on the development of animals and on the metabolism of phosphorus and nitrogen, M. MASSLOW (*Biochem. Ztschr.*, 55 (1913), No. 1-2, pp. 45-62).—The work here reported was done with young dogs, metabolism experiments being combined with analyses of all body tissues after death. Control animals were given a normal diet; others received cow's milk; others diets rich in protein, fat, and carbohydrates, but poor in phosphorus; and still others the same diets but with sodium phosphate, calcium glycerophosphate, and lecithin added.

None of the experimental diets was able to sustain life for more than a few weeks after the puppies had reached the age at which a mixed diet would be normally received.

Concerning phosphates, A. MAYBAUM (*Ztschr. Gesam. Getreidew.*, 5 (1913), No. 8, pp. 229-237).—According to the author, the diet of the well-to-do, which contains materials rich in phosphorus, such as vegetables, eggs, milk dishes, and meat of different sorts, supplies the body with more phosphorus than it needs, and so the kind of bread which is used is not a matter of importance. In general, he believes that the diet, even of those in straitened circumstances, supplies phosphorus enough, and therefore there is no reason for substituting black bread for white bread, since the excess of phosphorus which the black bread supplies is not needed, while the nitrogenous material and carbohydrates which the black bread supplies in smaller quantity than the white are both valuable and necessary.

Observations during training of a rowing crew, A. LEHRNBECHER (*Arch. Hyg.*, 81 (1913), No. 1, pp. 1-42, fig. 1).—The author, himself a member of the crew, made careful observation of the body weight, temperature, pulse rate, and urine of rowers during 6 weeks' training for a race. Fatigue was also studied by means of the dynamometer, measurements of skin sensitiveness, and simple arithmetical tests. Subjective impressions were noted in connection with the psychology of training.

It can not be denied, the author points out, that rowing in races involves certain dangers. Even with most careful selection of the men, overstraining of the heart, nervous disturbances, and the like may occur. Careful training,

however, removes such risks. The control of body as well as mind, involved in the race, the author regards as valuable discipline.

The influence of fatigue on the amounts present in blood serum of dialyzable compounds showing triketohydrindene hydrate reaction, E. ABDERHALDEN and A. E. LAMPÉ (*Hoppe-Seyler's Ztschr. Physiol. Chem.*, 85 (1913), No. 1-2, pp. 136-142).—Following the previously described method for detecting amino acid in blood serum (E. S. R., 26, p. 804), the authors tested the blood of dogs before and after violent exercise in a treadmill, but were unable to note any characteristic differences in the amino acid content of the 2 types of serum.

The influence of the cerebrum on the metabolism of matter and energy, K. HANNEMANN (*Biochem. Ztschr.*, 53 (1913), No. 1-2, pp. 80-99).—The respiration and calorimetric experiments here reported were made with laboratory animals (frogs). In one series, the entire cerebrum was removed, in another the cerebral hemispheres; and in a third the optical lobe. The author summarizes his results as follows:

(1) The removal of the entire cerebrum, the hemispheres, or the optical lobe, produced a marked increase in the gaseous exchange, which lasted for several days. (2) The oxygen as well as the carbon dioxid output was increased, the carbon dioxid increase being the greater save in those cases where the hemispheres alone had been removed. (3) Calorimetric observations showed that an increase of heat production accompanied the increased gaseous exchange.

The application of the second principle of thermodynamics to the processes in the animal organism, J. BÁRON and M. PÓLÁNYI (*Biochem. Ztschr.*, 53 (1913), No. 1-2, pp. 1-20).—A theoretical technical discussion of the theorem that "every isothermal physical and chemical process occurring in nature takes place in such wise that the free energy in the body concerned is lessened," with special reference to the transformations of energy in the animal organism.

Combustion calorimetry and elementary analysis with the calorimetric bomb, M. DIAKOW (*Biochem. Ztschr.*, 55 (1913), No. 1-2, pp. 116-123).—A technical article dealing with improved methods in the use of the Berthelot bomb in the analysis of urine and other materials.

ANIMAL PRODUCTION.

Feed control officials' convention (*Amer. Hay, Flour, and Feed Jour.*, 24 (1913), No. 1, pp. 19-34, figs. 10).—An account of the fifth annual convention of the Association of Feed Control Officials, held at Washington, D. C., November 17 and 18, 1913. Addresses were given on the following subjects: Screenings and weed seeds as adulterants in commercial feeds; observations relating to British feeding stuffs; the feed industry in the United States; and the composition of cotton-seed meal.

The composition of cotton-seed meal, G. S. FRAPS (*Amer. Hay, Flour, and Feed Jour.*, 24 (1913), No. 1, pp. 28-31).—In this paper, which was presented at the fifth annual convention of the Association of Feed Control Officials, the need of a fiber standard for cotton-seed meal in addition to the protein or fat standards is pointed out. It is shown wherein these latter standards alone permit the admixture of hulls with the meal, thus reducing its feeding value, though remaining within the bounds of a guaranteed protein analysis.

[Analyses of feeding stuffs] (*Min. Agr. et Trav. Pub. [Belgium], Off. Rural Raps. et Communs.*, 1913, No. 7, pp. 107, 108, 124-126).—Analyses are reported of cotton-seed meal, linseed meal, cacao hulls, perilla cake, and sugar beets.

Feeding stuffs (*Verslag. en Meded. Dir. Landb. Dept. Landb., Nijv. en Handel, 1913, No. 5, pp. 28-40*).—This includes analyses as to the protein and fat content of linseed cake, rape cake, cotton-seed meal, peanut cake, sesame cake, soy-bean cake, coconut cake, palm-nut cake, corn germ cake, gluten meal, and molasses cake.

Phosphate feeding to animals, A. GOUIN and P. ANDOUARD (*Jour. Agr. Prat., n. ser., 25 (1913), No. 26, pp. 809, 810*).—The authors disagree with the general conclusions of previous investigators that the natural phosphates are not assimilable by the animal body. They state that this depends mainly upon the age of the animal and cite the assimilation of phosphorus salts by young animals in their skeletal growth.

The growth of animals, C. J. DAVIES (*Live Stock Jour. [London], 78 (1913), Nos. 2065, p. 435; 2066, p. 459; 2067, p. 483*).—The approximate average increase in height or weight of various growing animals during the first 6 months is given as follows: Fourteen-hand horse, $\frac{1}{2}$ in. per week in height at withers; cattle 2 lbs. daily; sheep, goat, and pig, 8 oz., 6 oz., and 12 oz. daily, respectively; St. Bernard dog 8 oz. daily, field spaniel 2 oz., Scottish terrier 1 oz., toy spaniel $\frac{3}{4}$ oz.; cat, rather more than $\frac{1}{2}$ oz. per day; rabbit, large varieties $\frac{3}{4}$ oz., small varieties $\frac{1}{2}$ oz. daily; guinea pig, $1\frac{1}{2}$ oz. per week up to 4 months old, when growth slackens; fowl $\frac{1}{2}$ oz. per day, more or less according to breed; duck $\frac{3}{4}$ oz. per day; and pigeon, nearly $\frac{1}{2}$ oz. daily during the first month.

Economic factors in cattle feeding.—III, A review of beef production in the United States, H. W. MUMFORD and L. D. HALL (*Illinois Sta. Circ. 169, pp. 28, figs. 6*).—The previous numbers of this series have been reported (*E. S. R., 28, pp. 72, 365*).

The authors review the history and development of the beef production industry in America, beginning with the early part of the nineteenth century in southern Ohio, thence throughout the Mississippi Valley, and finally by reason of the extension of railroads and the invention of the refrigerator car and tin can into the remote western States. While the period from 1867 to 1900 shows an increase in the number of cattle on farms and ranges of 48,000,000 the last decade has shown a slight decrease. This decrease is accentuated by the rapid increase in population, the proportion of cattle to population being 75 per cent in 1910 as compared to 84 per cent in 1890. The valuation of cattle in the United States has increased \$129,000,000 in 7 years, but the export of meat products has been reduced to an almost negligible amount due to home consumption.

Data taken from the Thirteenth Census are cited to show that while more than two-thirds of the cattle other than milch cows are west, more than two-thirds of the population are located east of the Mississippi River. Chicago and cities west of there have developed as the great cattle markets of the country. Kansas City outrivals all other centers as a feeder market, both as to the actual number shipped out and the proportion of feeders to total shipments. Statistics gathered in 1903^a indicated that only one-half of the 13,000,000 cattle marketed for slaughter that year were slaughtered in large central markets.

It is shown that while there has been a decrease in the number of cattle on the range, this section is undergoing a transition which may result in increased production in the future.

Reviewing the cattle situation in Mexico and Canada the authors do not regard these countries as being immediately available as sources of meat supply. It is believed that the Southern States offer abundant opportunities for the promotion of stock raising.

^a U. S. Dept. Com. and Labor, Rpt. Comr. Corporations on Beef Indus., 1905, pp. XXXVI + 315.

Steer feeding, J. C. BURNS ET AL. (*Texas Sta. Bul.* 159, pp. 5-34, figs. 12).—Continuing previous work (E. S. R., 28, p. 169), four lots of seven 2-year-old steers each, weighing approximately 850 lbs., were fed for a period of 139 days on the following rations: Lot 1, 2 lbs. cotton-seed meal, 20 lbs. cotton-seed hulls; lot 2, 2 lbs. cotton-seed meal, 24 lbs. silage (mainly sorghum and cowpea, partly corn); lot 3, 2 lbs. cotton-seed meal, 10 lbs. cotton-seed hulls, 12 lbs. silage; lot 4, 3 lbs. cotton-seed meal, 24 lbs. silage, with results as follows:

Summary of steer-feeding experiments.

Lot.	Average daily gain per head.	Cost of feed per pound of gain.	Shrinkage per lot.	Average dressing percentage.	Net profit per steer.
	<i>Pounds.</i>	<i>Cents.</i>	<i>Pounds.</i>	<i>Per cent.</i>	
1	2.61	5.90	177	58.03	\$14.32
2	2.29	5.19	105	59.19	20.01
3	2.49	6.17	138	58.92	15.84
4	2.26	4.98	107	58.54	18.70

It is estimated that 1.67 tons of silage are equivalent to one ton of cotton-seed hulls in feeding value, also that cotton-seed meal at \$27 per ton is more profitable than cotton seed at \$17 per ton in supplementing silage to form a fattening ration. From these and former experiments it is concluded that a combination of cotton-seed meal and silage is the most profitable ration that can be used for feeding cattle in Texas.

In another experiment 2 lots of 16 steers each, weighing approximately 775 lbs., were fed for a period of 139 days on a basal ration composed of cotton-seed meal, ground milo maize or Kafir corn, and silage; lot 1 receiving cotton seed hulls, lot 2, sorghum hay, the same quantity being fed to each lot. In this trial lot 1 made an average daily gain of 2.97 lbs. per head, at a cost of 8.93 cts. per pound gain, and yielding a net profit of \$4.86 per head; lot 2, 3.1 lbs. gain, cost 9.08 cts., and profit \$4.10. In addition profits from hogs following the steers were credited to the steers at \$3.95 a head.

It is estimated that 100 lbs. sorghum hay is equivalent to 105 lbs. cotton-seed hulls.

Beef making in southern Texas, J. E. WING (*Breeder's Gaz.*, 64 (1913), No. 21, pp. 984, 985, figs. 2).—An account of beef production methods in the tick-infested section of southern Texas. Zebus are crossed on Shorthorn, Hereford, and grade cattle, the Herefords being deemed preferable. The offspring develop fast and as yearlings are said to weigh 1,000 lbs. and as 2-year olds 1,700 lbs. The half-blood calves do not develop the hump nor the dewlap of the zebu. Because of the natural adaptability of the zebu to southern Texas conditions an effort is being made to fix a type intermediate between the Indian cattle and the natives.

Value of Oldenburg marsh pasture, M. PORR (*Landw. Jahrb.*, 44 (1913), No. 3, pp. 441-517, fig. 1).—This is a report of 3 years' experiments in feeding cattle on Oldenburg marsh pasture, a mixture of white clover, rye grass, timothy, and meadow barley. The average feeding period for 2- and 3-year-old steers was 167 days; the average daily gain approximately 1.1 kg.; the feed number or number of kilograms of live weight supported per hectare during the entire pasture period, 208,239; and the fat number or kilograms of gain per day per hectare, 2.81. The first period of pasturing, consisting of 92 to 124 days, showed an average daily gain per hectare of 3.39 kg.; while the second period of 39 to 81 days showed a gain of 1.73 kg., thus indicating the greater value of the pasture during the first two-thirds of the entire feeding period.

In the winter feeding of steers on hay from these pastures the weights of the animals were retained to better advantage than those fed oat, wheat, and barley straw in various proportions.

The average pasture period for milch cows was 175 days; the feed number 171,187; the milk yield per day per hectare 19.47 kg.; the butter yield per day per hectare 0.68 kg.; the average increase in weight per cow 41.6 kg.; and the average value of skim milk and butter proceeds per hectare in 180 days 401.38 marks.

It is estimated that the average annual proceeds per hectare of pasture land was 387.68 marks and of tillable land 899.74 marks.

Color in Shorthorn cattle, E. N. WENTWORTH (*Amer. Breeders Mag.*, 4 (1913), No. 4, pp. 202-208, fig. 1).—In commenting on the theories on color inheritance advanced by several investigators, the author calls attention to the possible sources of error in computation from matings. He estimates the possible error at from 35 to 40 per cent. These errors have arisen through incorrect recording of colors, largely because of color fashions, and the tendency of breeders to report only fashionable colors so far as possible. He considers roan a mosaic, believing it to be "a simple dominant pattern consisting of an irregular arrangement of red and white hairs. It varies in amount of white within itself, hinting at the fact that it is probably not a single unit but complex."

Report of the American Bison Society (*Ann. Rpt. Amer. Bison Soc.*, 6 (1913), pp. 61, figs. 18).—The report of this society, whose object is the permanent preservation and increase of the American bison, states that a census of the American bison in North America in January, 1913, indicates that there are captive in the United States 1,651 head, in Canada 1,303, and wild in North America 499, making a total of 3,453. A herd has recently been established on the Niobrara Reservation in northern Nebraska.

The breeding of caracul sheep, A. GOLF (*Tropenpflanzer*, 17 (1913), No. 11, pp. 593-602).—In this article the author outlines the general advantages of the caracul breed of sheep, both as to wool-bearing qualities and native hardiness, and discusses the advantages ensuing from the crossing of these on the native sheep of Dutch East Africa.

Strange sheep of Asiatic Russia, C. C. YOUNG (*Amer. Breeders Mag.*, 4 (1913), No. 4, pp. 184-192, figs. 6).—An account of the native sheep of Asiatic Russia.

These sheep are mostly brown or black in color and are noted for their great hardiness and digestive abilities. There are 2 principal types, the fat-rumped (Kurdiuk) type (*Ovis steatopyga*) and the broad-tailed species (*O. platyura*). The caracul breed belongs to the latter. The purpose of the introduction of this breed into the United States is for fur raising and to improve the hardiness and mutton qualities of the short-wooled breeds. The fat-rumped type is said to be the heaviest of all known sheep. It is red in color, has coarse stiff wool like our mountain sheep, and "the tail consists of only 3 or 4 vertebrae, generally atrophied, with 2 immense symmetrical fat lobules covering the buttocks and extending below the knees, weighing from 20 to 40 lbs., long pendulous ears, decidedly convex nose, and a very large head."

The sheep and wool industry, H. D. BAKER (*Daily Cons. and Trade Rpts. [U. S.]*, 16 (1913), No. 289, pp. 1256, 1257).—An account of the breeding of fat-tailed sheep in Afghanistan and of the economic value of this breed in providing food, grease, and wearing apparel to the natives.

On account of its good quality of wool the Afghanistan sheep are occasionally crossed with Indian sheep and the wool of these cross breeds appears to be of fine quality and long. It is reported that attempts to cross the fat-tailed

and Merino breeds of sheep have met with difficulty owing to the aversion of one breed for the other.

Spanish goats, H. H. MORGAN (*Daily Cons. and Trade Rpts. [U. S.], 16 (1913), No. 283, p. 1167*).—It is reported that there are upwards of 3,500,000 goats in Spain. These goats weigh from 55 to 96 lbs., and the daily average milk yield is a little over 2 qt. per goat. The animals are said to be fed entirely on dried alfalfa and beans, live to the age of 15 or 16 years, and are productive at the second year. The finest breed of goats and those producing the largest quantity of milk are raised in Murcia Province, south of Alicante. Large numbers are slaughtered for home consumption and the exports of goat skins are heavy.

Steamed and dried potatoes, VON HERTZBERG-HOHBÜCH (*Deut. Landw. Presse, 40 (1913), No. 89, p. 1059*).—A brief account of successful swine-feeding trials with steamed and dried potatoes.

Horse breeding in New Jersey, F. C. MINKLER (*Ann. Rpt. N. J. Bd. Agr., 40 (1912), pp. 29-36*).—A general discussion on the type of horse required for New Jersey conditions and on methods of horse improvement through community breeders' associations, etc.

Distribution of public service stallions enrolled in the counties of Wisconsin during 1913, A. S. ALEXANDER (*Wisconsin Sta. Circ. Inform. 45, pp. 97*).—This circular lists the enrolled stallions in Wisconsin by counties, together with a text of the Wisconsin stallion law, with amendments and additions. It is shown that a total of 1,704 pure-bred stallions and 1,712 grade and mongrel or scrub stallions are enrolled for public service in the State. The number of pure bred is constantly increasing, while the grades and scrubs are decreasing in number.

The commercial fattening of poultry, A. R. LEE (*U. S. Dept. Agr. Bul. 21, pp. 55, pls. 5*).—This is a continuation of work previously noted (*E. S. R., 26, p. 76*).

The average cost and amount of feed consumed in fattening 394,744 chickens at the 4 feeding stations during the season of 1911 were, respectively, as follows: Grain per pound of gain, 3.62, 3.33, 4.45, and 4.18 lbs.; cost of feed per pound of gain, 7.83, 7.2, 7.15, and 8.71 cts.; total cost per pound of gain, 9.18, 9.2, 8.96, and 10.27 cts. The averages in 1912 for 498,681 chickens were: Grain per pound of gain, 4.42, 3.58, 3.72, and 4.98 lbs.; cost of feed per pound of gain, 8.74, 7.7, 6.61, and 9.95 cts.; total cost per pound of gain, 10.37, 9.69, 7.98, and 11.54 cts.

It was found that "tallow, while making the fat on the birds more pronounced, increased the cost of gains. Thick condensed buttermilk in place of tallow produced better results. Oat flour produced greater gains than low-grade wheat flour, but the latter feed produced cheaper gains. Beef scraps added to the buttermilk in a fattening ration did not increase the gain. The addition of condimental feeds did not increase the appetite of the birds or help the gains. Grit is of no value in fattening for any period under 15 days. Under commercial conditions in the Middle West the best results are secured by fattening for about 14 days until the middle of September, and then gradually shortening the period to 6 or 7 days. The birds ate more feed on three feeds a day but used feed more efficiently when fed only twice.

"Mechanical labor-saving devices reduced the cost of fattening by reducing both the total amount of labor and the proportion of skilled labor required. The portable feeding battery turned out the birds in better condition and reduced the cost of labor per pound of gain. Gains were produced at 1.89 and 1.41 cts., respectively, per pound cheaper in 1911, and 6.3 and 2.68 cts. less in 1912 on broilers than on roasters, in 2 experiments.

"There was great variation in the results secured in fattening. This was due to the difference in the ability of the birds to take on flesh, to their weight, and to the effect of weather conditions. The variation in birds makes their selection in fattening of considerable importance, if the labor of the extra work can be handled economically. The influence of the weather in fattening allows a chance of error in comparing fattening experiments conducted at different times. The bleach produced by fattening with buttermilk varies according to the amount of milk solids consumed by the birds.

"The average cost of fattening hens in November and December was 10.92 and 8.74 cts. in 1911, and 10.83 and 10.43 cts. in 1912, respectively, per pound of gain at two stations. This is higher than the average cost of fattening chickens for the entire season at the same stations but less than the cost of fattening chickens in November and December. Hens cost 7.7 cts. per pound in 1911 and 10.3 cts. in 1912, into the feeder, so that their flesh can be bought cheaper than produced at this time of the year. Cheaper gains were secured in fattening hens in 1911 on the rations used in fattening chickens than on a ration of corn chop with 15 per cent of shorts mixed with buttermilk.

"Chickens cost 17.6 cts. per pound into the feeder in July, 1911, while the gains cost 7 cts. per pound at this time; in November, 1911, they cost 9 cts. per pound into the feeder, and the gains cost 10.5 cts. per pound. This influences the profit in fattening and the best length of time to fatten, making it advisable to feed longer in the first part of the season. The cost of picking, grading, and packing (including freezing) was about 7 cts. per head, making the total average cost of a pound of dressed poultry in July 20.5 cts., which gradually decreased through the season to 13.1 cts. in November, 1911.

"The best results were secured with the following 3 rations: No. 1, corn meal, low-grade wheat flour, and shorts 3:2:1; No. 2, corn meal and low-grade wheat flour 3:2; and No. 3, corn meal, low-grade wheat flour, and shorts 5:3:1, and 5 per cent of tallow. The same feeding value is secured in a ration of corn meal and oat flour 3:2 but at an increased cost of 37 cts. per 100 lbs. of gain. Corn meal, low-grade wheat flour, and shorts 4:2:1, gave very good results during the latter part of the feeding season, or in cool weather; that is, the proportion of corn meal and low-grade wheat flour may be increased in cool weather."

The origin of the "systems of selecting layers," J. H. ROBINSON (*Farm Poultry*, 24 (1913), No. 12, pp. 246-248).—Comments are made on the reliability of the Hogan method of selecting laying hens and determining their capacity for laying (E. S. R., 30, p. 270).

Fifth Annual Conference of Poultry Farmers (*Dept. Agr. N. S. Wales, Farmers' Bul.* 71, 1913, pp. 25).—This includes a report of the conference, together with papers on the following subjects: Quality as a factor in production; the cost or rearing; management, housing, and confinement; wart disease; and the limitations of egg production. In the last paper the author calls attention to the dangers ensuing from forced egg production, among others to the deterioration in the quality of eggs, ovarian troubles, faulty incubation, and weakly chickens.

The poultry industry in the United States, H. R. LEWIS (*Ann. Rpt. N. J. Bd. Agr.*, 40 (1912), pp. 81-92, pls. 6).—A discussion on the poultry industry in the United States in general and New Jersey in particular. Items included are selection, feed, care and management, desirable rations, and poultry house construction.

A remarkable hybrid (*Country Life [London]*, 34 (1913), No. 882, p. 761, fig. 1).—An account of a hybrid between a black-winged peacock and a domestic hen, this being the second known cross of this kind.

Ostrich foods and feeding, W. G. DOWSLEY and C. GARDNER (*Grahamstown, So. Africa* [1913], pp. VII+189).—This volume treats in detail on the breeding, feeding, care, and management of the ostrich for commercial purposes.

Further experiments on ovarian transplantation in guinea pigs, W. E. CASTLE and J. C. PHILLIPS (*Science, n. ser.*, 38 (1913), No. 987, pp. 783-786).—These studies are a continuation of work previously reported (*E. S. R.*, 25, p. 867).

The ovaries of a light cinnamon guinea pig were transplanted into the body of a brown one, and the grafted animal was mated with an albino male. She produced 3 albinos and 2 colored, both cinnamon. The albino offspring proved to be potential cinnamons, having inherited cinnamon from the graft contained in the foster mother. Further tests indicated that these offspring were merely heterozygous in cinnamon, since the father was albino and did not transmit cinnamon. A cinnamon female offspring when mated with her albino father produced among others a cinnamon young, thus not only inheriting this color herself but transmitting it to her offspring. It is stated that this evidence indicates that "in the higher animals germinal substance and body are physiologically distinct, and that the genetic potentialities of the latter are not subject to modification through somatic influence."

A large number of grafts were made. Difficulty was experienced in making successful transplantations, due to the intolerance of the body to foreign tissue.

Color, sex, and fertility: Their relationship in guinea pigs, PRÉVOT (*IV. Conf. Internat. Génétique Paris, Compt. Rend. et Raps.*, 1911, pp. 511, 512).—It was observed that in furs of guinea pigs in which white is the predominant color, females preponderate to the extent of 58.6: 41.3. In all other types of coloring, males predominate, the numbers varying from 53 and 55 per cent males to 45 and 47 per cent females. White guinea pigs were the most fertile, and those types nearest to the wild type the least prolific. It was found that the yellow guinea pig is completely sterile, as has been observed in the case of yellow mice.

DAIRY FARMING—DAIRYING.

The cost of raising a dairy cow, C. M. BENNETT and M. O. COOPER (*U. S. Dept. Agr. Bul.* 49, pp. 23, figs. 6).—Cost records were kept during 1908-1912, inclusive, of Jersey heifers on a Wisconsin dairy farm. During the 5 record years 117 calves were handled, 73 being fed the full period of 2 years. The quantity of each feed consumed was obtained by actual weighing, the prices being the local prices of feeds at the farm as reported at the end of each month. During the first year the calves were fed whole milk about 30 days, then gradually turned to skim milk with the addition of an increasing amount of grain mixture (bran, oats, and oil meal, 4:5:1), clover-mixed hay, alfalfa, and corn silage. The average quantity of feed consumed per head during the first year was whole milk 342 lbs., skim milk 3,165 lbs., mixed hay 857 lbs., corn silage 353 lbs., grain mixture 547 lbs., pasture 123 days. Of the total cost, \$24.58, whole milk comprised 21.3, skim milk 25.7, and grain mixture 28.2 per cent.

The average man labor per head per year was 39.9 hours and horse labor 3.5 hours, making a total cost of \$5.14, when man labor is estimated at 12 cts. per hour and horse labor 10 cts. The first 2 months were the most expensive, the combined cost of feed and labor for this time being 32.5 per cent of the yearly cost.

During the second year, pasture, mixed hay, corn silage, and corn stover were fed at their appropriate times during the year. The average quantity of feed

consumed per head during the second year was mixed hay 1,120 lbs., corn silage 3,250 lbs., corn stover 672 lbs., and pasture 171 days. The total feed cost for the second year was \$16.11. Man labor was estimated at 23.25 hours and horse labor 0.75 hour per head, costing a total of \$2.86, and making the total cost of feed and labor for the second year \$18.97. The initial value of a calf, \$7.04, based on the cost of maintaining 2 herd bulls, together with other costs, brought the total cost of a dairy heifer 1 year old to \$42.52, or a net cost of \$39.52, crediting manure at \$3. The average total cost of a 2-year-old heifer was \$69.41, or \$61.41 crediting manure at \$8. Of these costs it was found that feed comprises 65.5 per cent, labor 12.5, and all other costs 22 per cent of the total cost of a dairy heifer at 2 years. "It would appear that a farmer can not afford to raise a heifer calf that will not sell for more than \$60 at 2 years of age."

Escutcheon theory in milkers (*Live Stock Jour.* [London], 78 (1913), No. 2067, p. 489, figs. 15).—Comments on the Guenon theory on the relation between escutcheon and milk yield are given, with illustrations showing the extent to which the escutcheon may be modified by the influence of either parent, the difference in its value according to the breed in which it is found, and other difficulties which beset the student of the Guenon theory.

On the Normandy breed of cattle, HÉDIARD (*Indus. Lait.* [Paris], 38 (1913), No. 49, pp. 781-795).—The average milk yield of this breed is estimated at from 16 to 19 liters (16.9 to 20 qts.) per day, and the average butter production at 832 gm. (1.83 lbs.) per day with a maximum of 1.717 kg. The adaptability of this breed to French conditions is discussed and its improvement and breeding advocated.

Russian milch cows, N. E. HANSEN (*Chicago Dairy Produce*, 20 (1913), No. 30, p. 19).—A brief account of the Kirghiz cattle of southern Siberia, which are said to be immune to tuberculosis and produce a considerably higher percentage of milk fat in their milk than any other known breed. The possibility of transferring this immunity to other breeds by crossing is considered.

On the feeding value of fermented sugar-beet tops for dairy animals, A. MORGEN, C. BEGER, and F. WESTHAUSSER (*Landw. Vers. Stat.*, 79-80 (1913), pp. 637-666).—In experiments with milking sheep and goats, in which ensiled sugar-beet tops were compared with an ordinary ration of hay, corn, meal, gluten meal, and oil meal as milk producers, it was found that the beet tops were an insufficient feed and failed to keep up the milk yield. A combination feed of the ordinary ration and beet tops proved most effective. The feeding of sour milk in quantity proved detrimental to milk production.

Beet tops in relation to the microflora and sanitation of milk, C. GORINI (*Molk. Ztg.* [Hildesheim], 27 (1913), No. 86, p. 1666).—In feeding both fresh and soured beet tops to dairy cattle, the number of gas-forming bacteria in the milk was found to be high. With beet tops which had been subjected to a drying temperature milk was produced showing a lower germ content, especially of the putrefactive bacteria. The digestive tract and the feces were similarly affected. The number of germs was still further lowered on feeding completely sterilized beet tops.

Milk hygiene, C. J. MARSHALL (*Penn. Live Stock Sanit. Bd. Circ.* 25, 1913, pp. 32, pl. 1, figs. 9).—This circular includes a general summary of the necessary requirements for milk hygiene, together with brief notes on the selection of cows, grooming, caring for sick cows, feeding, watering, and handling the milk. There are also included general plans of construction for stables, milk houses, and ice houses.

The improvement of the milk supply in the towns of the United Provinces of Agra and Oudh, H. R. C. HAILEY (*Dept. Land Rec. and Agr. United Prov.*

Agra and Oudh, Agr. Ser., 1913, Bul. 29, pp. 14).—Among the remedies proposed for the improvement of the town's milk supply are those of municipal control and management of dairies, community breeding schemes, and provisions for town pastures. It is stated that in these Provinces the main difficulties in the way of development of the milk industry for supplying large towns consist of (1) the small capital of the dairymen and the absence of any form of association among them, (2) the want of proper accommodations, (3) the poverty of most of the breeds of cattle of these Provinces as milkers, (4) the absence of grazing ground for dry cattle, and (5) the scarcity and high price of fodder.

Certified milk, T. C. McCLEAVE (*Jour. Amer. Med. Assoc., 61 (1913), No. 23, pp. 2031-2035*).—An account of the origin and development of the certified milk movement, together with a detailed discussion of the methods of organizing and the duties of city milk commissions.

[Reports of the state dairy and food commissioner and the state chemist on dairy products], W. HANSON and H. HARMS (*Bien. Rpts. State Dairy and Food Comr., State Chem., and State Dairy and Food Bur. Utah, 1911-12, pp. 29-36, 79-105*).—These reports discuss the enforcement of the state laws relative to the sale of dairy products in Utah, including a special report on shrinkage in butter.

Weighings of 15 samples of butter showed an average loss in moisture in 6 weeks of 2.78 per cent. Fifteen other samples showed after about 1 month a loss of 2.18 per cent of moisture, while 5 samples of cold storage butter lost 1.34 per cent.

Daily changes in the specific gravity and fat content of milk, KLOSE (*Milchw. Zentbl., 42 (1913), No. 13, pp. 385-392*).—The specific gravity and fat content of morning, noon, and night milkings were taken daily for several months in a herd of 70 milch cows.

The daily changes in specific gravity ranged between 0 and 0.0037 and in fat between 0 and 0.7 per cent. During March 10 per cent of the changes in specific gravity ranged between 0.001 and 0.0019 and 18.9 per cent of the fat changes between 0.2 and 0.45 per cent. In May 33 per cent of the specific gravity changes were between 0.001 and 0.0017, and 30 per cent of the fat changes between 0.2 and 0.5 per cent. In July 31.1 per cent of the specific gravity changes were between 0.001 and 0.0037, and 34.4 per cent of the fat changes between 0.2 and 0.7 per cent. In October 10 per cent of the specific gravity changes were between 0.001 and 0.0018, and 34.4 per cent of the fat changes between 0.2 and 0.5 per cent.

The elimination of artificial coloring matter by the udder, P. SISLEY and C. PORCHER (*Compt. Rend. Acad. Sci. [Paris], 157 (1913), No. 17, pp. 729-732*).—Experiments were conducted on the goats with various coloring materials.

Uranium produced only a slight trace of coloring in the urine, both when taken into the stomach and when injected into the jugular vein. No change was noted in the milk and it is concluded that the udder opposes the passage of certain substances. Rhodamin when taken into the stomach produced rose-colored milk after 10 hours. After that the coloring rapidly diminished. The coloring was also present in the urine. The proportion of rhodamin present in the milk was small compared with the amount taken into the body. One gm. of methylene blue produced no effect on either the milk or urine; 3 gm. produced a trace in the milk and urine. Ponceau taken into the stomach showed no presence in the milk. With dimethylamino-azobenzene, the milk showed a rose coloration on the addition of a small quantity of HCl. However, the elimination was transient.

These results confirm earlier investigations (Déchavanne, 1909). They indicate first, the very diffusibility of these coloring matters in the animal body;

second, the course of assimilation; and third, the filtering ability of the mammary glands. These glands seem to possess a resistance to some substances and not to others.

Influence of fertilizing and feeding on the milk constituents. O. ALLEMANN (*Abs. in Molk. Ztg. [Hildesheim], 27 (1913), No. 86, p. 1666*).—Various quantities of iron lactate, calcium sulphate, the phosphates of calcium, magnesium, and sodium, sodium chlorid, potassium chlorid, and potassium nitrate were fed to milch cows with their regular grain and hay ration.

The inorganic salts showed no influence on the milk constituents. The feeding of a large quantity of beets increased the volatile fatty acids. Feeds such as sesame cake increased the quantity of oleates in the milk fat. Feed from heavily fertilized land resulted in no change in the composition of the ash content of milk. The fat and sugar content of milk proved to be independent of either fertilizing or feeding. No relation was observed between the curd content of milk and fertilizing.

The influence of work on the milk yield and fat content (*Milchw. Zentbl., 42 (1913), No. 14, pp. 429-432*).—Cows were worked during 9 to 10 hours each day with the result that their milk yield was decreased, while the content of dry substance and fat in the milk was increased over the amounts obtained during a rest period.

The milk of cows in heat, H. STENG (*Arch. Hyg., 78 (1913), No. 6, pp. 219-247; abs. in Centbl. Bakt. [etc.], 2. Abt., 39 (1913), No. 4-7, p. 133*).—Results of tests indicate that there is a change in the chemical composition of milk during the period of estrum, although the change is not uniform. The fat content is often lowered, especially on the following day. The milk sugar content and refraction remain the same or are slightly increased. The acid quantity is somewhat increased and the milk becomes sour more rapidly during this period. The specific gravity is changed with difficulty. The milk at this time is thought to contain a toxin (ovariotoxin) which is the cause of a form of digestive trouble in infants.

[Reagent for detecting freshness in cows], H. SCHEEL (*Eignet sich die Schardingerreaktion zur Feststellung des Frischmilchendseins der Kühe? Inaug. Diss., Tierärztl. Hochsch. Hannover, 1912; abs. in Milchw. Zentbl., 42 (1913), No. 13, pp. 393, 394*).—Tests were made of a formalin methylene blue solution known as Schardinger's reagent.

It was found that the foremilk of cows fresh in milk failed to discolor the reagent in less than 30 minutes. Milk of cows in advanced lactation in most cases discolored the reagent, the foremilk in 30 minutes and the strippings in 12 minutes. The reaction is altered by the time of milking, the condition of the udder, and other factors, thus rendering a diagnosis as to the freshness of cows by this reagent indecisive.

Changes undergone in the milk of cows infected with foot-and-mouth disease, O. MEZGER, H. JESSER, and K. HEPP (*Ztschr. Untersuch. Nahr. u. Genussmtl., 25 (1913), No. 9, pp. 513-551*).—It was observed that at the beginning of the disease there was a concentration of the milk, especially as to the content of fat and nitrogenous material, and frequently of the ash, chlorin, and phosphoric acid, while the milk quantity decreased. With the improvement of the animal, the milk quantity and the milk sugar content increased, while the fat and nitrogenous material were lowered. It was noted that the higher the milk sugar and ash content, the higher was the refraction of the serum. The observations of other investigators are noted.

[Composition of condensed milks], J. C. BRUNNICH (*Ann. Rpt. Dept. Agr. and Stock [Queensland], 1912-13, p. 77*).—Analyses of 47 samples of condensed

milks showed the following average composition: Cane sugar 41.88, fat 9.84, and milk solids-not-fat 23.63 per cent.

Process for producing desiccated milk, A. A. DUNHAM (*U. S. Patent 1,074,419, Sept. 30, 1913; abs. in Jour. Soc. Chem. Indus., 32 (1913), No. 21, p. 1027*).—A report of a patent process by which "milk is partially evaporated at a temperature below the coagulating point of albumin, and then dried and subjected to a blast of hot air on a rotating cylinder heated internally to above the coagulating point of albumin."

The function of colloids and their relation to swell, R. M. WASHBURN (*Ice Cream Trade Jour., 9 (1913), No. 11, pp. 32, 33*).—In discussing the effects of gelatin and similar colloidal substances in ice cream making, the author advances the theory that "the function of gelatin is primarily to form a closed capsule about the minute water crystal and thereby retard crystallization; and that the function of vegetable gum is chiefly to stick these many gelatin capsules together, thus holding the mass intact." It is further claimed that the contentions against the use of gelatin on the ground of increased swell are ill founded because of the inability of gelatin to produce this.

[Butter inspection], J. C. BRUNNICH (*Ann. Rpt. Dept. Agr. and Stock [Queensland], 1912-13, p. 55*).—As the result of butter inspection it was found that 46.5 per cent of the samples contained boric acid as a preservative, ranging in amount from a trace to 0.8 per cent. The average moisture content of 289 samples of salted butter was 14.44 per cent and of 22 unsalted samples 14.79 per cent, the highest percentages being in the winter months and the lowest in the summer months.

Fat content of cheese, H. FINCKE (*Ztschr. Öffentl. Chem., 19 (1913), No. 22, pp. 430-433*).—Inasmuch as the fat content of cheese, as based on the dry substance, ranges between 50 per cent for cream cheese to less than 10 per cent for skim-milk cheese, the author advocates a fat content standard for the different types of cheese ranging from 30 per cent for cream cheese to less than 5 per cent for skim milk, this to be determined on the entire cheese mass.

A comparison of the different methods of dividing the proceeds for milk at cheese factories, L. A. ZUFELT (*Ann. Rpts. Dairymen's Assocs. Ontario, 1912, pp. 52-57*).—An examination of the tests of 2 cheese factories indicated that no constant relation exists between the fat and casein in the milks of individual patrons, but that on the contrary the casein shows a greater variation than the fat. The results of manufacturing into cheese different milks containing varying amounts of fat and casein indicated first, that the straight "fat" method of payment approaches more nearly the actual value of the milk than the "fat+2" method when quantity alone is considered; and second, that the difference between the "fat" and "fat and casein" methods is so small as hardly to warrant the extra expense of a casein tester.

Reindeer milk and cheese, C. BARTHEL and A. M. BERGMAN (*Ztschr. Untersuch. Nahr. u. Genussmitl., 26 (1913), No. 5, pp. 238-241, figs. 2; abs. in Chem. Zentbl., 1913, II, No. 18, p. 1606*).—The average composition of reindeer milk is given as follows: Water 63.3, protein 10.3, fat 22.46, milk sugar 2.5, and ash 1.44 per cent. The average size of fat globules is 5 microns. The composition of cheese is water 28.81, protein 22.57, fat 44.02, other organic material 2.2, and ash 2.4 per cent.

VETERINARY MEDICINE.

[Veterinary work in foreign countries] (*Arb. K. Gsndhtsamt., 43 (1912), No. 3, pp. 313-453; 44 (1913), No. 4, pp. 608-728*).—Accounts are presented of veterinary affairs in foreign countries, including organization, the kinds and

number of animals, inspection and traffic, veterinary police work, meat inspection, etc., as follows: In Switzerland, by Ströse (pp. 313-360); in Denmark, by Hall (pp. 361-435); in Egypt, by Zeller (pp. 436-453); in Sweden, by Hall (pp. 608-677); and in Italy, by Wehrle (pp. 678-728).

Annual report of the Punjab Veterinary College, Civil Veterinary Department, Punjab, and the Government Cattle Farm, Hissar, for the year 1912-13, II. T. PEASE, J. FARMER, and R. BRANFORD (*Ann. Rpt. Punjab Vet. Col. and Civ. Vet. Dept., 1912-13, pp. III+2+15+XVII*).—This is the usual annual report dealing with veterinary progress in Punjab, occurrence and treatment of contagious diseases, breeding operations, etc.

The phosphatids of the kidney, M. MACLEAN (*Bio-chem. Jour.*, 6 (1912), No. 4, pp. 333-354).—"The acetone insoluble phosphatids of the horse kidney are lecithin, cuorin, and a diaminomonophosphatid—carnaubon. All these are contained in the primary ether extract, while the subsequent alcoholic extract contains lecithin and carnaubon; cuorin, being insoluble in alcohol, is not present here. Thus, so far as solubility allows, the lipoids of the ether extract are the same as those present in the alcoholic extract. In the kidneys investigated, the ethereal extract contained much more cuorin than lecithin.

"A method is described whereby the complicated alcoholic extract can be purified from a nitrogenous substance. In all tissues investigated hitherto, the phosphatids of the alcoholic extract must have been contaminated by this substance; this explains many of the divergent results obtained. The diaminomonophosphatid isolated has all the properties of a substance found in ox kidney by Dunham and Jacobson, and called by them carnaubon. They state that this substance is a triaminomonophosphatid. It is probable that carnaubon is not a tri-, but a diaminomonophosphatid, and that the methods used for its isolation by Dunham and Jacobson were inefficient to obtain a pure substance. On extracting a substance obtained by the method employed by the above investigators with water, a diaminomonophosphatid was obtained."

Contributions to the biochemistry of growth.—The glycogen content of the liver of rats bearing malignant new growths, W. CRAMER and J. LOCHHEAD (*Proc. Roy. Soc. [London], Ser. B*, 86 (1913), No. B 588, pp. 302-307).—"Glycogen disappears more rapidly from the liver of tumor-bearing rats than from the liver of a normal rat. Since observations on the gaseous metabolism showed that there is no increased oxidation of carbohydrate material in tumor-bearing animals, the results confirm the conclusion arrived at previously from observations on pregnant animals, that in growth carbohydrate material is used for the synthesis of protoplasm."

About some biological properties of the spleen in experimental nagana infection, P. RONDONI and G. GORETTI (*Ztschr. Immunitätsf. u. Expt. Ther.*, I, Orig., 17 (1913), No. 4, pp. 432-443).—It was found that the spleens from guinea pigs and rats affected with nagana were trypanolytic. No marked accumulation of immune antigens originating from trypanosomes in the spleen was noted. The spleen of these animals was found to have in vitro marked hemolytic (auto-, iso-, and heterolytic) properties, which is due to an increased amount of lipoids in the spleen.

About leucocyte-dissolving immune bodies, E. LESCHKE (*Ztschr. Immunitätsf. u. Expt. Ther.*, I, Orig., 16 (1913), No. 5-6, pp. 627-632, fig. 1).—By giving intravenous injections of leucocytes from various species of animals, i. e., man, horse, etc., specie-specific antileucocytic immune bodies are produced. These show agglutination, complement fixation, and cytolysis (incomplete) for leucocytes.

Immunizing against calves' rennet, S. G. HEDIN (*Hoppe-Seyler's Ztschr. Physiol. Chem.*, 77 (1912), No. 3, pp. 229-246; *abs. in Centbl. Bakt. [etc.]*, 1.

Abt., Ref., 53 (1912), No. 10, p. 292).—A study was made of the behavior of normal serum with rennet obtained from various animals, and the results show that the inhibition of rennet action is not specie specific. The immunization of rabbits with rennet zymogen (neutral infusion of the mucous membrane from the calf) at first shows a larger output of antirennet than when immunization is done with rennet. Only after immunizing over a long period of time are the results alike. The same antistubstance appears to be produced in both cases. The most important property of the antirennet and of the inhibitory substance in the zymogen is the specie-specific inhibition whereby they are distinguished from the inhibitory substances present in normal serum. The antibody is preserved better in the serum kept in vitro than in the animal body.

The relation of precipitins to complement, A. LEBAILLY (*Ztschr. Immunitätsf. u. Expt. Ther., I, Orig., 15 (1912), No. 6, pp. 552-575*).—It was possible by the fractional addition of antigens to precipitins to separate the complement fixation process from the precipitation process. According to this, in all probability the complement fixation does not belong to the precipitins but to the lytic amboceptors which accompany the precipitins.

The protecting influence of complement (alexin) upon protein metabolism, E. HEILNER and R. SCHNEIDER (*Ztschr. Biol., 59 (1912), No. 8, pp. 321-334*).—It has been previously shown^a that during anaphylactic shock protein metabolism is considerably reduced. In these experiments starving animals were injected with homologous and heterologous sera, and from the results it can be noted that complement (alexin) seems to have some relation to protein metabolism when viewed in the light of protective immunity. The presence of complement (protective enzyme) is necessary for the normal cycle of protein decomposition, and when the amount of complement is reduced, the decomposition increases proportionately.

In starving animals the regeneration of complement destroyed by the injection of foreign blood corpuscles does not occur any quicker than it does in normal animals. This is probably due to a destruction of the cells (but no definite group of cells) which produce the complement. After injecting 6 gm. of a foreign blood corpuscle suspension into animals, the amount of urine is greatly increased. No appreciable increase was noted when homologous protein was given.

The influence of giving sodium chlorid per os on the cycle of anaphylaxis, E. FRIEDBERGER and H. LANGER (*Ztschr. Immunitätsf. u. Expt. Ther., I, Orig., 15 (1912), No. 6, pp. 535-545*).—By the administration of large amounts of table salt per os, it is possible to prevent the anaphylactic symptoms which occur as a result of a second injection of a protein. The tests were conducted with normal and starving guinea pigs.

Is it possible to produce an anaphylatoxin-like cleavage product by allowing normal sera to act upon histidin? E. FRIEDBERGER and H. LANGER (*Ztschr. Immunitätsf. u. Expt. Ther., I, Orig., 15 (1912), No. 6, pp. 528-534*).—By the action of a normal guinea pig serum on histidin hydrochlorid at 37° C. it is not possible to produce a substance which is acutely toxic or lethal for guinea pigs.

The nature of antianaphylaxis, R. WEIL and A. F. COCA (*Ztschr. Immunitätsf. u. Expt. Ther., I, Orig., 17 (1913), No. 2, pp. 141-155*).—From some quantitative experiments it is concluded that antianaphylaxis, as held by Rosenau and Anderson, Wells, Friedberger, and Szymanowski, is strongly specific. It is concluded that antianaphylaxis is produced by the neutralization of specific antibodies.

^a *Ztschr. Biol., 58 (1912), No. 7, pp. 333-354, figs. 3.*

Precipitation in meat poisoning, with an observation in regard to the occurrence of hemolysins against sheep blood corpuscles in paratyphoid B-Gärtner antiserum, A. ROTHACKER (*Ztschr. Immunitätsf. u. Expt. Ther.*, 1, Orig., 16 (1913), No. 5-6, pp. 491-503).—An antiserum for paratyphoid B and Gärtner bacilli may be produced if a mixture of these organisms is injected into rabbits. The precipitating reagents so produced act specifically with an extract made from the flesh of animals dying from meat poisoning, and with an extract of a mixture of the paratyphoid B and Gärtner bacilli. Boiled meat extracts give positive but less definite results. The best results are obtained with acetone-sodium chlorid extracts of the meat. The complement fixation reaction is deemed of no value for the direct determination of either of the two-named organisms in meat. A marked increase in hemolysin for sheep corpuscles (not for man, bovines, or guinea pigs) is noted as a result of the treatment with paratyphoid B and Gärtner bacilli.

Suprarenal glands and toxi-infections, A. MARIE (*Ztschr. Immunitätsf. u. Expt. Ther.*, 1, Orig., 17 (1913), No. 4, pp. 420-431).—The results show that natural or synthetic adrenalin will neutralize tetanus antitoxin in vitro, but when in the presence of substances which can be easily oxidized, like hemoglobin, the neutralization is somewhat inhibited. The suprarenal glands, whether in the form of an emulsion made from the powder, or a glycerin extract, have no neutralizing effect upon the toxins. The extract also destroys the neutralizing power of adrenalin in vitro. The alkaloid of the suprarenal glands also neutralizes diphtheria antitoxin, but none of the neutralizing powers was observed in vivo.

About the action of formaldehyde and salicylic acid on the formation of botulinus toxins, R. H. SALTET and J. ZEEHANDELAAR (*Pharm. Weekbl.*, 48 (1911), No. 50, pp. 1337-1340; *abs. in Centbl. Bakt. [etc.]*, 1. Abt., Ref., 55 (1912), No. 8, p. 229).—Alkaline bouillon cultures of *Bacillus botulinus* were given subcutaneously to guinea pigs with lethal results. When, however, the culture medium was treated with formaldehyde 1:20,000, or with sodium salicylate 1:2,500, and then injected, the animals remained alive.

The experimental production of pernicious anemia in rabbits, H. M. ADLER (*Jour. Med. Research*, 28 (1913), No. 1, pp. 199-226).—Fat in the form of olive oil or cotton-seed oil was found to be toxic to rabbits, if fed in sufficiently large quantities. The toxicity of cotton-seed or olive oil depended upon its content of unsaturated fatty acid. The more unsaturated the fats fed, the greater the toxic effect. Long continued daily feeding of nontoxic doses of oil produced blood crises resembling pernicious anemia, as well as extreme emaciation. Long continued feeding with nontoxic doses of quinin protected rabbits against the effects of fat intoxication, probably because of an effect upon the lymphoid tissue. The anemia thus produced is probably due to a destruction of red cells in the blood vessels of the abdominal organs rather than to a direct effect upon the bone marrow. This effect, being at the periphery in respect to the blood-forming organs, acts as a stimulant to the bone marrow and, as a result, high red blood counts are encountered. The hemolytic substance, being a fat, is not capable of true solution in the body fluid, and is therefore present in the body in the form of more or less finely divided colloidal particles.

"The hemolytic effect is not a uniformly diffused one, but is dependent upon the meeting of a particle of hemolytic fat with a red cell. The degree of injury to the individual cell depends upon the size and number of particles acting upon it. The anemia is, therefore, not one uniformly affecting the red blood cells. The red cells show all possible variations from well-colored and normally formed individuals to extreme achromia, etc. The manifestation of the toxicity

of fat is due to the summation of individual reactions between body cells and effective particles."

Contributions to the diagnosis of anthrax by the Ascoli precipitation method, T. OSCANDER (*Beiträge zur Diagnose des Milzbrandes mittels der Präzipitationsmethode nach Ascoli. Inaug. Diss., Tierärztl. Hochschule, Stuttgart, 1912; abs. in Centbl. Bakt. [etc.], 1. Abt., Ref., 55 (1912), No. 6, pp. 164, 165*).—In these experiments artificially infected guinea pigs and rabbits, and the organs from naturally infected animals which died from anthrax or were slaughtered were used. In addition, the organs of a pig found to be affected with anthrax after slaughter were examined.

The reaction is considered specific for anthrax. It is obtained instantly with extracts made from the spleen, heart, liver, kidney, and the small intestines, but was sluggish with extracts made from the stomach or large intestines. In only one case, that of the pig mentioned above, were negative results obtained.

The various methods of preparing the extract, i. e., from fresh or putrefied material by boiling or with the aid of chloroform, had no effect upon the outcome of the reaction. Extracts prepared from the lungs or muscles had a peculiar opalescence. The conservation of the pathologic material with alcohol, glycerin, and formaldehyde, and then drying at 120° C. did not seem to affect the reaction. With extracts of organs which were buried for 32 days a positive reaction was obtained even when milk of lime or petroleum was poured over the cadaver.

For carrying out the test a fresh and highly potent serum is deemed always necessary.

About the fluctuations of the agglutination titer in glanders, I. K. PAVLOVICH (*K Voprosu ob Agglutinatsii pri Sapië u Loshadei. Inaug. Diss., Vet. Inst. Kharkof, 1912, pp. 128; abs. in Centbl. Bakt. [etc.], 1. Abt., Ref., 55 (1912), No. 16, pp. 487, 488*).—The agglutinations obtained with the same serum but with various strains of the glanders bacillus were very different. The organism cultivated rapidly on an artificial medium showed the strongest agglutination. For preparing the emulsion used in the test, the most efficient agent seemed to be Konev's antiglanders vaccine. This preparation is not very virulent and consequently is of less danger to the investigator using it. Its titer also remains very constant. The emulsion, which was kept in a flask wrapped up in a few pieces of dark paper, did not vary within 3 months' time. As the emulsion is very dense, it clouds the tests, and when judging macroscopically it shows a titer lower than really exists.

In the examination of samples of blood which were taken from diseased horses at rest, and sound horses which were immunized with killed glanders bacilli, i. e., those which were still affected with glanders or had gone through the cycle of the disease, no variation in the titer was noted for several days. The titer of the blood from horses whose organisms contained no living virus did not vary when the animals were driven hard, or following the subcutaneous introduction of arecolin, caffeine, spirits of camphor, or oil of turpentine. Horses harboring living virus were affected by the above-named factors. A blood with a high agglutination titer did not always give a positive complement fixation reaction.

The tests do not verify the findings of other authors that the agglutination titer of the blood of glandered horses rises directly after infection and then falls again, as an increase in the titer was noted only with those horses which were convalescing. The criteria set down by Schütz and Miessner are deemed liable to lead one into error.

Immunizing against glanders, DE BLIECK and BUBBERMANN (*Abs. in Berlin. Tierärztl. Wchnschr.*, 29 (1913), No. 26, pp. 470, 471).—Farase yielded fair results while those obtained with heated cultures of glanders bacilli (*malleus-vaccin*) were entirely unsatisfactory. With the latter toxin the disease was increased in extent, one of the two horses treated dying six weeks after the injection and the other being destroyed on account of being very cachectic. A control animal died eight weeks postinfection. Five horses were treated with farase, four with the powdered preparation, and one with the liquid product. On autopsy it was found that none of the animals absolutely withstood the infection, but with only one exception all animals showed a partial immunity.

The canine piroplasmoses of Europe and Africa, A. LAVERAN and NATTAN-LARRIER (*Ann. Inst. Pasteur*, 27 (1913), No. 9, pp. 701-717, figs. 5).—Of seven dogs which were inoculated with the African virus after having been immunized with the French virus six succumbed to piroplasmosis. Two dogs inoculated with the French virus after having been immunized with the African virus suffered a light infection which terminated in recovery. The authors conclude that the African piroplasm, if not a separate species, is at least a variety distinct from the piroplasm occurring in dogs in France.

The culture of Babesia (Piroplasma) canis in vitro, J. G. THOMSON and H. B. FANTHAM (*Ann. Trop. Med. and Par.*, 7 (1913), No. 4, pp. 621-632, pl. 1, figs. 5).—"We have succeeded in cultivating *B. canis* in two out of four attempts, following the method of Bass, using blood and glucose, and incubating at 37° C. In one of these cultures, starting with heart blood containing corpuscles infected with one, two, or, exceptionally, four piroplasmata, we succeeded in obtaining a maximum of 32 merozoites in a corpuscle.

"Various types of Babesia were seen in these cultures, namely, pyriform, ameboid, rounded, and oval parasites. Division of rounded forms was observed, following the method of gemmation with chromatinic forking. There was evidence, in stained specimens, of direct binary fission. Hemolysis occurred in all the culture tubes. A puppy was successfully inoculated from a 41 hours' culture and succumbed to piroplasmosis on the fifth day. *B. canis* is not so easily cultivated by Bass's method as the malarial parasites of man."

On the cultivation of the malarial parasites and of piroplasms (Piroplasma canis) in vitro, H. ZIEMANN (*Arch. Schiffs u. Tropen Hyg.*, 17 (1913), No. 11, pp. 361-391, pls. 2, figs. 3).—The author reports upon his successful cultivation of *P. canis*, and gives a bibliography of 21 titles.

On the multiplication of Piroplasma canis in vitro, KNUTH and RICHTERS (*Berlin. Tierärztl. Wchnschr.*, 29 (1913), No. 12, pp. 211, 212; *abs. in Rev. Gén. Méd. Vét.*, 21 (1913), No. 248, p. 462).—The authors report having succeeded in cultivating *P. canis* and here describe the method employed, which is a modification of the Bass method of cultivating the malarial organisms. The best results were obtained with a mixture of equal parts of the defibrinated blood of a mildly infected dog and of a 2 per cent glucose solution, kept at room temperature.

About the formation of an acute anaphylaxis from acid-fast bacteria and from the neutral fat of the tubercle bacillus, E. LESCHKE (*Ztschr. Immunitätsf. u. Expt. Ther.*, I, Orig., 16 (1913), No. 5-6, pp. 619-626).—The results show that by treating acid-fast pathogenic and nonpathogenic organisms with normal serum, it is possible to produce an acute lethal poison. The toxin can also be produced from neutral fats and from the fat of the tubercle bacillus (*tuberculonastin*) by treatment with normal serum.

Notes on the biology of the tubercle bacillus, T. SMITH (*Jour. Med. Research*, 28 (1913), No. 1, pp. 91-110).—"Tubercle bacilli of both human and

bovine type, when kept in fully developed cultures at 40 to 50° F., may remain infectious to guinea pigs for from 7 to 19 months. The number of bacilli surviving in such cultures is relatively small. Many tubercle bacilli from easily cultivated strains which fail to multiply on fresh culture media will multiply in guinea pigs. In one of the experiments one-fifteenth hundredth of the mass which failed to grow on glycerin agar was still capable of producing generalized tuberculosis.

"Of the 2 strains tested side by side, the bovine was more resistant than the human strain. This may be in part accounted for by the fact that the human type produces much more acid in 5 per cent glycerin bouillon than the bovine type after 2 to 4 weeks of growth. It may also be due to a greater inherent resistance of the bovine type. In all experimental studies bearing on the behavior and fate of tubercle bacilli in the animal body, the character of the culture must be taken into account and its history should be known.

Do bovine tubercle bacilli occur in the sputum of tubercular human subjects? E. WÜRM LIN (*Kommen im Sputum von Phthisikern bovine Tuberkelbazillen vor?* Inaug. Diss., Tierärztl. Hochsch. Dresden, 1911, pp. 72; *abs. in Centbl. Bakt. [etc.]*, 1. Abt., Ref., 53 (1912), No. 20, p. 616).—In this investigation 44 strains of bacteria were isolated from the sputum of 24 human subjects; and 30 of these were examined. Guinea pigs were injected with 0.01 gm. of the pure cultures, and in 18 cases the guinea pigs remained sound. In 12 instances, however, the tubercle bacilli were more or less strongly virulent, and 9 of the strains produced a low grade of pulmonary and glandular tuberculosis. As a result of the tests 27 strains were pronounced to be of the human type, but the author was not able to state whether the remaining 3 strains were of the human or bovine type, consequently the problem stated in the title is unanswered.

About the growth and virulence of the causative organisms of fowl tuberculosis, W. CARL (*Arch. Path. Anat. u. Physiol. [Virchow]*, 207 (1912), No. 1, pp. 140-148; *abs. in Centbl. Bakt. [etc.]*, 1. Abt., Ref., 53 (1912), No. 20, p. 622).—Among a number of strains of tubercle bacilli, one showed a very dry growth on glycerin agar, and in this respect resembled the human type of bacillus. The characteristics were maintained after growing for 2 years. Inoculating the material produced an increase in virulency. Two rabbits treated with the original material died from generalized tuberculosis 8 days postinfection, the one with miliary tuberculosis of all organs. In contrast to this one guinea pig succumbed to a local tuberculosis, and another became generally tubercular after 158 days. A guinea pig treated with the material from the latter animal died in 136 days. A third generation produced an infection only of the regional lymphatic glands. A fowl fed with the raw material did not become sick. Intraperitoneal injections into 4 chickens resulted in typical fowl tuberculosis.

The tuberculin tests for tuberculosis in cattle, E. T. HALLMAN (*Michigan Sta. Spec. Bul.* 62, pp. 3-8).—This bulletin, which is written in popular style, discusses the factors which led up to the use of tuberculin for diagnosing tuberculosis, the preparation of tuberculin, arranging the animals for tuberculin testing, making the test, and interpreting the results of the subcutaneous thermal test. In addition the intradermal and ophthalmic tests are described.

Extracts from the state live stock sanitary laws are included.

New experiments in connection with the vaccination of cattle against tuberculosis, A. CALMETTE and C. GUÉRIN (*Ann. Inst. Pasteur*, 27 (1913), No. 2, pp. 162-169; *abs. in Jour. Compar. Path. and Ther.*, 26 (1913), No. 1, pp. 88-90).—The experiments reported deal with the excretion of tubercle bacilli

with the bile, and the retention of tubercle bacilli in the lymphatic glands of vaccinated animals. In a previous communication (E. S. R., 21, p. 683) it was shown that cattle which have been hyperimmunized by intravenous treatment with large doses (up to 200 mg.) of the bovine type of bacillus, which were cultivated successively on media containing ox bile, eliminated tubercle bacilli with their excreta. The same elimination was noted with tubercular cattle.

Thinking that possibly some of the tubercle bacilli were eliminated by way of the bile duct, the authors conducted experiments with 2 heifers having artificial permanent biliary fistula. These animals were inoculated with tubercle bacilli and the bile was withdrawn several times during the days following the injections. The first heifer received 4 intravenous injections of 10 mg. each of the bovine tubercle bacilli. The bile was then injected into 260 guinea pigs, but only 12 were found tubercular. Some guinea pigs also received injections of the feces and 2 of them became tubercular. The heifer was killed after about 4 months' time, or 2 days after the last injection of tubercle bacilli was given, and on autopsy was found to be in very good condition, not a single tuberculous focus being found after a very careful examination. After the first inoculation no tubercle bacilli were eliminated with the bile, and probably the power of elimination was established only after a certain state of tolerance was reached. "This retention of bacilli after the first inoculation is observed in healthy cattle inoculated with a dose of bovine tubercle bacilli sufficiently large to determine an acute and rapidly fatal tuberculosis. The authors have shown that bacilli are not eliminated during the febrile period of the disease, but that bacilli are present in the excrement from the commencement of the febrile phase up to the time of death."

The second heifer was given 3 mg. of virulent bovine tubercle bacilli intravenously, and a number of guinea pigs were inoculated with bile as in the preceding case. "The animal's temperature remained normal until the sixteenth day, when there was a sudden rise. There was fever until the twenty-eighth day, when the heifer died. All the guinea pigs were killed 2 months later, and not one of the 78 inoculated during the first 19 days was found to be tuberculous. Of the 31 inoculated subsequently 15 were found to be diseased. There can therefore be no doubt that during the febrile period bacilli are eliminated with the bile in large numbers. The authors think that their experiments prove that cattle that are affected with tuberculosis, whether open or not, or that have been vaccinated with attenuated or human bacilli, are capable of eliminating by the hepato-intestinal tract a larger or smaller number of tubercle bacilli which, according to their origin or degree of virulence, may be a source of danger to healthy people compelled to live under conditions which make it impossible for them to protect themselves against contamination."

As to the retention of tubercle bacilli in the lymphatic glands, it is pointed out that on a previous occasion (E. S. R., 20, p. 877) sound laboratory animals which had been rendered immune would not react, in the way of forming lesions, to an injection of virulent bacilli, nor would they react toward tuberculin, but when slaughtered some 16 to 18 months later, tubercle bacilli could be noted in the bronchial and mediastinal glands. This was proved by the guinea pig inoculation test.

This tolerance which the animals had acquired toward virulent bacilli was, according to the authors, due to the power which the animals had acquired of slowly eliminating the organisms from their systems, being unable to destroy them by the phagocytic and similar processes. The authors are also under

the impression that the power of tolerance might eventually be lost and that the elimination would then be complete. Experiments were accordingly made to determine the period of retention of the bacilli used for the test inoculation. The bacilli were subcultivated for a long period of time on glycerinized ox bile. Eight heifers which did not react toward the tuberculin test were used in the experiments. "Seven of them were killed 1, 2, 3, 4, 8, 12, and 18 months, respectively, after the test inoculation. At the post-mortem of each the bronchial glands were removed, triturated in their entirety, and injected subcutaneously into 12 guinea pigs. The latter were killed 2 months later. It was found that while none of the vaccinated heifers showed any lesions of tuberculosis at the post-mortem, every one of the guinea pigs inoculated was tuberculous. It was thus proved that a vaccinated animal might carry the virulent bacilli used for the test inoculation in its glands for 18 months after the test inoculation without their producing any lesions, although their continued virulence could be proved.

"The eighth heifer was tested with tuberculin 18 months after the test inoculation and did not react, although she no doubt harbored virulent bacilli in her glands as did the 7 that were killed. A second inoculation of 3 mg. of virulent bovine bacilli was given, but there was no elevation of temperature, and 3 months later the animal had every appearance of being in perfect health. The authors conclude that their experiments indicate that when animals are vaccinated with attenuated bacilli of the bovine type and are then subjected to a test inoculation, they do not develop any evidence of tuberculosis, but they retain virulent bacilli in their glands for periods extending into months. A number of the bacilli are passed out gradually with the excreta, as proved by guinea pig inoculations."

The vaccination of bovines against tuberculosis with bacilli of bovine origin possesses great advantages, but it is necessary to have an attenuated strain of which considerable doses can be given to bovines with ease, and which are not capable of producing lesions. The strain possessed by the authors is supposed to fulfill these requirements. It is avirulent for the ox, monkey, and guinea pigs, and confers a lasting resistance on bovines when given intravenously, but the duration of the immunity has not been established.

The hog cholera question, J. PEKAR (*Berlin. Tierärztl. Wchnschr.*, 29 (1913), No. 26, pp. 467-469).—A polemic in regard to priority and a restatement of the facts about septic endometritis and abortion present in hog cholera. The author believes that classical hog cholera, swine plague, and septicemia can be produced in pigs of all ages by simply feeding them in uterine secretion obtained from hogs affected with hog cholera, swine plague, etc. The condition produced is accompanied by an endometritis. Methods for treating the above are included.

What the agricultural experiment station hog serum laboratory is doing for California hog raisers, C. M. HABING (*Univ. Cal. Jour. Agr.*, 1 (1913), No. 1, pp. 8-13, figs. 3).—This paper gives an account of the work being carried on in the preparation and distribution of antihog cholera serum in California.

About pyobacillosis in pigs and serum treatment for the same, O. STENSTRÖM (*Svensk Vet. Tidskr.*, 17 (1912), No. 9, pp. 293-297; *abs. in Berlin. Tierärztl. Wchnschr.*, 29 (1913), No. 26, p. 471).—In an epizootic in which a great many pigs died five shoats on autopsy were found to have a pleuropneumonia, and from parts of the lungs, etc., the *Bacillus pyogenes* could be isolated. Of 60 pigs, 2 to 4 weeks old, treated with 2.5 cc. of *B. pyogenes* serum (Jensen), none died, while 2 animals kept as controls succumbed. The author concludes that the serum when used in large doses (15 cc.) has curative properties.

Epizootic encephalomyelitis in the horse, J. M. QUEVEDO (*Rev. Zootéc.*, 4 (1912), No. 39, pp. 163, 164; *abs. in Vet. Rec.*, 25 (1913), No. 1283, p. 487).—The author reports studies of an epizootic affection among horses caused by the feeding of moldy corn, which has resulted in the loss of numerous animals during the past two years. Injections of cultures of *Aspergillus maydis* into the rabbit, goat, and calf produced symptoms and lesions similar to those observed in the horse.

Some aspects of mange in horses, A. W. N. PILLERS (*Vet. Rec.*, 26 (1913), No. 1326, pp. 356–362, pls. 2).—A summarized account which deals with the subject under the headings of (1) the position of the mange mites in nature and their synonymy; (2) the characteristics of the various genera; (3) a rough outline of their life histories; (4) their vitality; (5) the degree of parasitism; (6) seasonal occurrence; (7) parts affected; (8) diagnosis; and (9) principles of treatment.

A new means of transmitting the fowl nematode, *Heterakis perspicillum*, J. W. SCOTT (*Science*, n. ser., 38 (1913), No. 984, pp. 672, 673).—In feeding experiments conducted at the Kansas Experiment Station, the author has found that this nematode may be transmitted to young chicks by a dung earthworm, probably *Helodrilus parvus*, which is found in horse manure. Three chicks to which were fed a total of 78, 64, and 53 worms, respectively, between July 17 and 29, were killed on September 5, and 20 adult nematodes were found in the first, 6 in the second, and 2 in the third. Eight chicks used as checks were found to be free from the worms. Thus it appears that *Helodrilus* may in some way serve as an intermediate host for this nematode, but it remains to be determined whether the earthworm is a true intermediate host, or if the eggs of *Heterakis* simply cling to the slimy surface of the earthworm and are transmitted in this way.

RURAL ENGINEERING.

The selection and installation of a small pumping plant for irrigation, B. A. ETCHEVERRY (*Engin. and Contract.*, 40 (1913), No. 19, pp. 522–527).—The author discusses as interdependent factors upon which the proper selection of a pumping plant depends (1) the source of water supply, (2) capacity of plant and period of operation, (3) kind of pump, (4) class of engine or driving power, (5) first cost, (6) fuel cost, and (7) the cost of fixed charges and attendance.

Several tables of data are given showing capacities and efficiencies of different types of pumps and pumping plants, the power required to operate pumps, and the costs of pumping with different kinds of power at different lifts. It is shown that the cost per acre of pumping is much larger for a small area than for a large area, but it does not vary materially with the period of operation. In some cases a plant moderately large operated for a shorter period will cost less per acre than a smaller plant operated a longer period, due to the lower fuel cost with the larger and more efficient plant and the decreased cost of attendance for the shorter period of operation, which overbalance the larger fixed charges.

Some of the advantages of underground pumped water as compared to water obtained from the gravity irrigation system are stated as follows: The underground supply is more reliable and is not likely to be deficient before the end of the irrigation season. The irrigator is independent and controls his own water supply and is prepared to irrigate his crop at the best time. Underground water is also free from the seeds of weeds.

It is stated that there is a limit beyond which it is not economically feasible to pump. For small pumping plants and small areas it is well not to exceed 200 ft., but for larger plants lifts of 400 ft. may be economically feasible.

About irrigation of cultivated soils, KRÜGER (*Mitt. Ökonom. Gesell. Sachsen, 1912-13, pp. 71-113, figs. 26*).—This is a review of the operation and experimental results obtained from several methods of irrigation of cultivated soils, in which the spray system is favored. Several types of spray irrigation systems are described.

Irrigation of the Ica Valley, C. W. SUTTON (*Min. Fomento, Bol. Cuerpo Ingen. Minas Perú, 1913, No. 79, pp. 198, pls. 13*).—This publication presents the results of preliminary hydraulic studies in this valley, reports on the soil and climate, and gives considerable cost data on the design, construction, and operation of the irrigation system.

Irrigation by lateral percolation, M. RINGELMANN (*Jour. Agr. Prat., n. ser., 26 (1913), No. 30, pp. 110-112, figs. 3*).—Ditch subirrigation as practiced in parts of France, Spain, Egypt, Hawaii, and the United States is described. Attention is called to the large amounts of water used and lost in irrigating sugar cane, cotton, and grain by this method, it being stated that from 40 to 50 per cent is lost by seepage and evaporation.

Irrigation and water power laws of the State of Nebraska in force July 17, 1913 ([*Lincoln, Nebr.*]: *State Board Irrig., 1913, pp. 79*).—These laws include (1) general provisions concerning irrigation water power, (2) provisions concerning the State Board of Irrigation, Highways, and Drainage, (3) the construction and operation of irrigation works, and (4) irrigation districts.

Irrigation laws [of New Mexico] (*Santa Fe, N. Mex., 1913, pp. 32*).—Provisions of the constitution and laws of the State of New Mexico are given relating to the incorporating and government of irrigation companies and water users associations.

Irrigation laws of Wyoming in effect September 1, 1913 (*Laramie, Wyo.: State Engin., 1913, pp. 81*).—The text of these laws is given.

[Subsoil drainage for preventing malaria], C. STRICKLAND (*Agr. Bul. Fed. Malay States, 2 (1913), No. 2, pp. 36-42*).—The author advocates subsoil drainage by tile purely as an antimalarial measure and considers this a safe and sure method of eradicating the malaria mosquito. As an economic phase of this work he suggests that only those spots be so drained which have been scientifically established as breeding places of the malaria mosquito.

Economies of highway location; formulas and methods employed in locating roads (*Engin. and Contract., 40 (1913), No. 18, pp. 478-483, figs. 17*).—An abstract of a paper read before the International Road Congress by E. Masik presents a study of the economies of road location from a thoroughly European view point, considering general direction, alignment, grades, methods of locating the center line, longitudinal and cross sections, curves, and the calculation of maximum permissible speeds of motor cars on curves.

Action of calcium chlorid on roads, F. R. NEWMAN (*Jour. Phys. Chem., 17 (1913), No. 8, pp. 703-706*).—From experiments made to determine the action of calcium chlorid on roads the following general conclusions are drawn:

The usefulness of calcium chlorid depends upon the presence of free calcium chlorid in the soil. Very little calcium chlorid is absorbed by the soil and consequently the salt can be washed out readily. The time during which it remains effective in laying dust depends on the amount of rain and on the readiness with which the water drains off, so that there is no basis for the claim that 2 treatments with calcium chlorid will keep a road in good condition all summer. On the other hand, it does not wash out of a road so rapidly as appearances might indicate.

Earthwork haul and overhaul, J. C. L. FISH (*New York and London, 1913, pp. XIV+165, pls. 3, figs. 50*).—Part 1 of this book deals with the computation of earthwork haul and overhaul and with the use of the mass diagram in planning distribution. Part 2 deals with the economic distribution of material along the profile by means of the mass diagram.

Some experiments with mortars and concrete mixed with asphaltic oils.—Some further tests of oil-mixed concrete, A. TAYLOR and T. SANBORN (*Proc. Amer. Soc. Civ. Engin., 39 (1913), No. 3, pp. 335-363, fig. 1; abs. in Concrete-Cement Age, 3 (1913), No. 1, p. 27*).—Tests of oil-mixed concrete using western oils yielded somewhat different results from those obtained in previous experiments by Page (*E. S. R., 28, p. 85*). The conclusions drawn from these tests are as follows:

(1) Oil-mixed concrete containing 5, 10, or 15 per cent of oil, by weight of cement, is more permeable under pressures from 20 to 60 lbs. per square inch than concrete without incorporated oil, and oil-mixed mortar containing 10 per cent of oil is more permeable than plain mortar under pressures of 10 and 20 lbs. per square inch. (2) Oil-mixed mortars containing oil up to 25 per cent show slightly less absorption of water than plain mortar, except that with the most viscous oils the mortar becomes more absorptive, and absorption is not an index of the permeability. The absorption decreases with the increase in the quality of oil. (3) The tensile strength of oil-mixed mortar is decreased considerably below that of plain mortar, and decreases with the increase in the quantity of oil. (4) The compressive strength of oil-mixed mortars follows lines similar to those of the tensile strength, but with a greater decrease in strength with the quantity of oil. (5) The strength decreases with the viscosity of the oils, and with the most viscous oils it requires considerably more water to keep a mixture at normal consistency than is required in the fluid oil mixtures. (6) The relative decrease in strength with the increase in the quantity of oil in mortars is less in 50 days than in 28 days.

Concrete on farms, J. WILSON (*Jour. Dept. Agr. Victoria, 11 (1913), No. 9, pp. 570-573, figs. 3*).—This article illustrates and briefly describes machines for making concrete blocks and fence posts and describes the construction of concrete block silos.

[Information regarding concrete farm structures] (*Concrete-Cement Age, 3 (1913), No. 1, pp. 36-39, figs. 7*).—A collection of articles which illustrates and describes the construction of concrete dipping vats for hogs and sheep, small concrete ice houses, sanitary floors in dairy barns, sanitary floors for poultry, sheep, and hog houses, and a concrete cooling vat.

A treatise on the inspection of concrete construction, J. COCHRAN (*Chicago, 1913, pp. XV+595, figs. 26*).—It is the purpose of this work to set forth in detail the principal points upon which an inspector of concrete construction should be informed. The instructions are said to apply to building construction and to practically any type of reinforced concrete construction. The subject matter is presented under chapters dealing respectively with the inspection of hydraulic cement, sand, stone, and miscellaneous concrete materials; proportioning and mixing concrete; forms, molds, centering, and falsework; steel reinforcement; concreting; surface finishes for concrete work; waterproofing for concrete work; concrete sidewalk, curb, and pavement construction; concrete products; and molding and driving concrete piles.

The warning is given to use judgment in applying these suggestions, and not to use them in opposition to specifications.

Farm gas engines, C. F. HIRSHFELD and T. C. ULBRICHT (*New York and London, 1913, pp. VII+239, figs. 188*).—This book is intended primarily to serve

as a guide when contemplating the purchase of an internal combustion engine for farm use. The theory underlying the operation of such engines is discussed only to the extent necessary to enable one to appreciate the conditions which must be met by any successful engine. The greater part of the book is devoted to a discussion of the weak and strong points in the various designs, to the features which give long and useful life and those which tend to cause early failure, and to the characteristics which best adapt different types to different uses. The subject matter is presented under the following chapters: The power problem; fuels; the internal combustion engine; the mechanical construction of the engine; principles of operation; indicator diagrams; power and gas engines; the cooling system; the valve system; comparison of two-stroke and four-stroke operation; carbureters; electric ignition apparatus; the governing systems; lubrication; desirable and undesirable features of construction; muffling and mufflers; power, price, and speed; and types of farm engines.

Drive belts, their use and care, K. KROHNE (*Mitt. Deut. Landw. Gesell.*, 28 (1913), No. 15, pp. 225-228, figs. 7).—This article reviews much experimental work with drive belts, which indicates that various kinds of work, requiring various speeds and various amounts of power, require varying widths of belt and pulley and diameters of pulley, with varying arrangements of pulley axle distances for highest power transmission. The importance is emphasized of obtaining the proper arc of contact, especially in case of high speed drive, for which purpose it is suggested that "the distance between pulley axles should be the difference between pulley diameters, multiplied by 2.5." A set of curves is given for determining the proper width of belt for agricultural work when the speed and diameter of the smaller pulley are given. It is generally concluded that the largest belt wheels possible should be chosen and that on the whole with increasing speed belt drive becomes more satisfactory.

The following gear ratios are suggested under the conditions named: One to 10 with horizontal pull by the lower part of the belt; 1 to 8 when the belt drives obliquely downward and 1 to 7 when the belt drives obliquely upward, the axle distance being normal and the lower part of the belt pulling; 1 to 6 when the upper part of the belt pulls, the axle distance is diminished, or the drive runs more obliquely than 45° ; and from 1 to 5 to 1 to 4 maximum when there are no tension-regulating devices used. The pulley width, it is stated, should be the computed belt width plus 10 per cent plus 10 mm.

Application of electric drive in greenhouses (*Elect. World*, 62 (1913), No. 17, pp. 841-843, figs. 7).—This article deals with the use of electricity in greenhouses, particularly describing the extensive use of both alternating and direct current motors in a greenhouse near Chicago for operating refrigerating apparatus, fertilizer unloaders and pumps, soil mixers, etc. The electrical energy for this plant is supplied in part by a private generating plant, which also supplies heat, and in part by a public service company.

The mechanical preparation of cereals for seed and the influence on quantity and quality of the yield, H. WACKER (*Landw. Hefte*, 1913, No. 21, pp. 59, pl. 1, figs. 18).—This publication describes and discusses various threshing, cleaning, and grading machines of the latest types. It is noted that these machines aid in increasing the yields of cereals by making it possible to select the best seed according to absolute weight, specific weight, volume weight, size, and form, and to cull out the weed seeds.

Centrifugal cream separators, H. TÖDT (*English Patent* 15,946, July 10, 1913; *abs. in Jour. Soc. Chem. Indus.*, 32 (1913), No. 20, p. 987).—"To prevent the formation of froth in the skim milk discharged from the tubes in the head of the centrifugal drum, a disk is attached to the top of this head, having passages which form continuations of the tubes for the skim milk, the passages

leading to a peripheral recess on the disk into which the skim milk is conducted. Thence it is withdrawn by means of a scoop-like tube dipping into the recess but fixed on the stationary part of the apparatus; this tube is provided with a nonreturn valve."

Farm ice houses, B. S. PICKETT (*Mass. Crop Rpt.*, 26 (1913), No. 5, pp. 38-45, figs. 4).—This article deals with types of ice storage houses, including ice pits, ice stacks, makeshift ice houses, and modern well-built ice houses. The importance of good drainage, ventilation, and insulation is emphasized, dead air, wood, and paper being considered the most effective insulating materials. A modern well-built ice house, holding from 30 to 50 tons of ice, of solid construction, properly drained, and neat in appearance is said to cost from \$50 to \$125 according as the farmer supplies or hires his own labor and material.

The silo—how to make it permanent (*Brick and Clay Rec.*, 43 (1913), No. 8, pp. 780-788, figs. 17).—This article notes the essential considerations for a first-class silo, analyzes and gives data for the design, and illustrates and describes the construction of reinforced burned clay block silos.

A combined silo and water tank (*Cement Era*, 11 (1913), No. 11, pp. 34, 35, fig. 1).—The design and construction of this reinforced concrete structure is described and diagrammatically illustrated. The silo proper is of 186 tons capacity, 14 ft. in diameter, and 48 ft. 6 in. high. The tank on top is 9 ft. high, 14 ft. in diameter, and has a capacity of 10,360 gal.

The pneumatic water system, J. H. BEATTIE (*Gas Rev.*, 6 (1913), No. 9, pp. 46, 48, 50, figs. 4).—A simple explanation of the principles involved and of the proper methods of connecting up the various types of pneumatic water systems is given to prevent the common difficulties met with, due largely to the improper application of principles. It is stated that the pneumatic water system when properly installed and operated should give as good service as any isolated system, but that proper design and first-class workmanship can not be urged too strongly.

A mechanically cleaned Berkefeld filter, GRIMM (*Mitt. K. Landesanst. Wasserhyg. Berlin-Dahlem*, 1913, No. 17, pp. 40-60, figs. 2).—This article describes an improved Berkefeld filter, which is mechanically cleaned by means of the agitating effect of water and air pressure on a cleaning medium of anthracite grit, and is sterilized by using hot steam in place of air and water pressure.

The results of 172 tests of this apparatus are reported in which 1-hour filter periods were immediately followed by 10-minute cleaning periods. Both filtering and cleaning were done under 3.5 atmospheres pressure. The apparatus was sterilized once a day with steam under atmospheric pressure, this operation taking 30 minutes. Water from the Spree River was used which contained a large number of bacteria and was also very turbid, resulting in a rapid clogging of the filter.

The results of these tests lead to the conclusion that until the filter cylinders break a practically bacteria-free filtrate may be obtained and that the mechanical cleaning of all the filters in 10 minutes is feasible and reestablishes the original filtering effect.

Design of Imhoff sewage plants, L. C. FRANK and F. FRIES (*Engin. Rec.*, 69 (1913), Nos. 17, pp. 452, 453, fig. 1; 18, pp. 501, 502, figs. 3; 19, pp. 519, 521, figs. 2).—In this series of 3 articles is summed up the 7 years' experience of the Emscher River Board in Germany in the design of Imhoff settling tanks. Part 1 reviews some fundamental considerations, and gives suggestions relating to the selection of preliminary screens and proportioning of grit chambers; part 2 makes suggestions relating to the length and cross section of the settling compartment, velocity of flow, detention period, and scum boards and baffles;

and part 3 discusses the proper size for the sludge storage compartment of tanks, depth as a factor in sludge digestion, pumping sludge, and drying beds.

Regulating the climate of the house, P. M. RILEY (*Country Life Amer.*, 25 (1913), No. 1, pp. 61, 62, 84, figs. 6).—The author points out that most homes are so nearly devoid of humidity during the winter as to be injurious not only to furniture, etc., but to the health of the occupants. He emphasizes the importance of maintaining a relative humidity of from 50 to 60 per cent as long as artificial heat is used in the house, and describes apparatus for regulating it.

Agricultural drafting, C. B. HOWE (*New York and London*, 1913, pp. VIII+63, figs. 78).—The purpose of this book is to assist the agricultural student to a knowledge of the principles of mechanical drawing and their practical application to agricultural engineering.

RURAL ECONOMICS.

Rural economics (*X. Cong. Internat. Agr. Gand*, 1913, Sect. 1, pp. [362], table 1).—This section of the report of the Tenth International Congress of Agriculture, devoted to rural economics, has been previously noted editorially (*E. S. R.*, 29, p. 101).

The organization of American agriculture, D. F. HOUSTON (*Amer. Coop. Jour.*, 9 (1913), No. 3, pp. 187-189).—It is pointed out in this address that there is available in the United States 935,000,000 acres of arable land, of which but 400,000,000 is included in farms and improved. The author considers that in fostering industrial centers agriculture has been entirely neglected, and that the United States has come to a point in its history when agriculture must be given the same chance as any other type of production. The greatest undeveloped source of the nation is its people, and the rural population has not had proper development along the lines of education, credit, business organization, sanitation, and social activities.

Marketing of farm produce for greatest profit under present market systems, G. O. VIRTUE (*Ann. Rpt. Nebr. Bd. Agr.*, 1913, pp. 297-306).—The author claims that the cost of marketing may be lessened by reducing the cost of transportation through better country roads and by marketing products in a more finished form and direct to the consumer. It is a question in his mind whether the farmer gains anything by holding his produce for better prices, as he considers that the speculator with his greater knowledge can do this better than the farmer.

A farm-management survey of three representative areas in Indiana, Illinois, and Iowa, E. H. THOMSON and H. M. DIXON (*U. S. Dept. Agr. Bul.* 41, pp. 42, figs. 10).—This bulletin is the result of a survey of 700 farms located in Indiana, Illinois, and Iowa.

Some of the more important conclusions reached were that the average labor income of farm owners was \$408, and of tenants \$370, in addition to the house in which they lived and the farm products used in the home. The landlords received an average of 3.5 per cent on their investment. The tenant's income was in direct proportion to his capital, size of farm, and education. It is stated that modern machinery, with the use of more horses and fewer men, has made the farms of less than 100 acres an inefficient unit. Farms that provide work for the farmer and his sons and permit of the best use of men, horses, and machinery were the most profitable. The yield per acre averaged about 2 per cent higher on farms operated by owners than those operated by tenants. The average labor income of 214 owners having common school education was \$301, and of 186 tenants \$742; of the 46 owners and 51 tenants having high school education \$651 and \$1,263, respectively; and of the 9 owners and 6 tenants having college education \$796 and \$1,721, respectively.

Data are also presented on the sources of farm receipts, distribution of farm expenses, systems of farm tenure, relation of the age of the farmer, etc.

Possible agricultural development in Alaska, L. CHUBBUCK (*U. S. Dept. Agr. Bul. 50, pp. 31, figs. 12*).—The author states that Alaska, with an area of 586,400 square miles, has 100,000 square miles susceptible of agricultural use, 30,000 square miles of which can be tilled. The author presents a summary of available data, including observations made of the south coast and the Yukon drainage areas. He discusses the topography, climate, vegetation, soils, possible agricultural areas, the feasibility of farming in Alaska, grain production, the reindeer industry, cattle and sheep raising, and the difficulties that confront the homesteader. He concludes that, although hardy vegetables, small fruits, and forage crops can be successfully grown over a wide area, and dairying, poultry keeping, and stock raising are promising industries, Alaska's present population does not afford sufficient home market to warrant large agricultural development, in view of the great cost of clearing and preparing the land for tillage. Very little of the available land has been surveyed, and if a survey is made in advance of that made by the Government it is done at the expense of the homesteader.

Farm tenancy in Iowa, B. H. HIBBARD (*Iowa Agr., 14 (1914), No. 5, pp. 242, 243*).—The author points out that in 1880 24 per cent of the farms in Iowa were rented; in 1910, 38 per cent. Grain farming is correlated with a high proportion of tenants, stock farming with a medium proportion, and dairying with a low proportion. Tenancy is high in counties where land is high priced and low where it is cheapest.

York state rural problems, I. L. H. BAILEY (*Albany, N. Y., 1913, pp. 273*).—This book is made up of 25 lectures or summaries of lectures delivered by the author at different places and on different topics. All deal with rural problems. The aim of the book seems to be to present in an impartial way the rural conditions and possibilities.

Rural life in Canada, J. MACDOUGALL (*Toronto, 1913, pp. 248, pls. 24*).—The author, looking at rural life from the religious point of view, calls attention to the depletion of rural population through the decay of village crafts, loss of commerce, and other changes in the modern industrial system. He believes that agriculture has failed to progress as rapidly in scientific business methods as the other industries, and attempts to show the moral effect upon the community that might result from the economic solution of the various rural problems.

The social unrest, according to the author, is due to lack of appreciation for country life, satisfactory laborers, means for social enjoyment, healthful recreation, education for country life, and appreciation of country values and community ideals. He explains the function of the church in rural life, laying emphasis upon social service and preventive work, and notes that rural reconstruction has been most effective where there has been a spiritual awakening accompanying it.

The land.—I, Rural (*London, New York, and Toronto, 1913, vol. 1, 4. ed., pp. LXXXIII+498, pl. 1*).—One of the more important facts noted in this report of the Land Enquiry Committee on the social and economic conditions in the rural parts of Great Britain is that the wages of agricultural workers are not sufficient to house and feed their families properly. The committee recommends that a wage tribunal be formed to fix a minimum wage which shall be sufficient to enable the laborers to live in a state of physical efficiency and to pay a commercial rent for their cottages.

The condition and number of laborers' cottages is also entirely unsatisfactory, resulting in the loss of laborers and a waste of time by the laborers who

remain, since they can not live near enough to their work. The poor housing conditions are responsible for the spread of many contagious diseases and immorality.

Small holdings are deemed desirable because of the greater independence and the relatively greater chance of the laborer rising to a better social position. The committee also considers that small holdings will increase the output and give employment to a larger number of persons per unit of area. To bring this about it is recommended that there should be a land court to fix the price of land, list vacant properties, and encourage the movement in every possible way.

Other means mentioned for improving the condition of agricultural workers are agricultural cooperation, credit, and education.

Rent, wages, and profits of British agriculture (*Economist*, 77 (1913), No. 3666, pp. 1175-1177).—By means of estimates the total output of agricultural products is distributed as follows: Landlords' share £38,500,000, share of the occupiers and their families £51,000,000, and share of wage laborers £30,500,000. The profits of occupiers represent the average income of £100 a year, of which £16 a year is taken from the farm in kind. Out of this income the occupier has to pay his rates, insurance, and replacement of the capital in addition to the personal expenses of his family.

Organization of small rural holdings, J. BENARD (*X. Cong. Internat. Agr. Gand*, 1913, Sect. 1, Ques. 3, pp. 9).—The conclusions reached are that the founding of small holdings would be a means of keeping a man attached to the soil, but that the area of land placed at his disposal must be sufficient to attach him firmly, and that loans granted by the mutual agricultural credit societies for the formation of these holdings will offer a guaranty such that the State could afford to encourage them. The object aimed at in the encouragement of small holdings should be ownership and not tenancy.

Desertion of the rural districts, E. LAUR (*X. Cong. Internat. Agr. Gand*, 1913, Sect. 1, Ques. 2, pp. 66).—The author, after calling attention to the fact that the rural population is becoming a smaller factor in the total population for practically every country, gives as some of the causes for this situation the lower wages in agriculture than in other professions, longer hours of labor, irregularity of employment, and unsatisfactory social position of the agricultural laborer, especially as relates to the large land proprietors. To improve the conditions of the rural working class he recommends the adoption of an agricultural policy favoring the formation of small holdings, improvement of agricultural technique, a campaign against pests of agricultural products, and the extension of the system of insurance.

Agricultural cooperation and rural credit in Europe (*U. S. Senate*, 63. Cong., 1. Sess., Doc. 214, 1913, pp. 916, pl. 1).—This document gives a statement of the information and evidence secured by the American Commission (E. S. R., 28, p. 301) while studying in European countries cooperative land-mortgage banks, cooperative rural credit unions, and similar organizations and institutions devoted to the improvement of rural conditions. It consists principally of speeches or special reports and statements prepared by representatives of the foreign countries for the use of the Commission.

Rural credit and cooperation in Hungary (*Budapest: Roy. Hungarian Min. Agr.*, 1913, pp. 100, pls. 2).—After calling attention to the peoples and agricultural resources of the country and the economic conditions of the farming classes, it is pointed out that because of the conservative tendencies of the Hungarian farmers the government has to take the initial step in practically all new agricultural undertakings. The State furnishes them with seed for sowing, seedling trees, and material for the breeding of live stock. Practically all of

the institutions furnishing agricultural credit had their origin with the State, yet the State does not own a single credit institution of public importance and confines its activities to regulating and supporting them financially.

A description is given of the various types of agricultural credit institutions, showing that the Hungarian Land Mortgage Institute was started to give credit to the large estate owners, and that later the National Small Holdings Land Mortgage Institute arose to furnish small holders with similar credit. The various private and public agencies granting credit to the farmer are noted, the most important being the Hungarian Central Credit Cooperative Society. This organization consists of 2,412 local societies, with 700,000 members, and grants most of its loans to small holders.

The methods employed for the cooperative use of machinery are given. Between 1897 and 1911 the number of dairy unions increased from 34 to 587, and the number of cows belonging to the members increased from 5,937 to over 100,000. A brief discussion of the distributive cooperative societies and the agricultural labor question in that country is included.

Causes and effects of the recent want of success in the department of cooperative agricultural credit in Germany and the lessons to be learned from it, GRABEIN (*Internat. Inst. Agr. [Rome], Mo. Bul. Econ. and Soc. Intel.*, 4 (1913), No. 12, pp. 1-17).—The author concludes that the lessons to be learned from the failure of cooperative credit banks in Germany are that the field of action of the rural loan and savings banks should be limited, not only as regards the granting of credits, but also as regards the credits received. The districts should not be too large. Inasmuch as the purpose of these banks is to satisfy the needs of the country districts for short term loans, loans to large manufacturers and dealers should not be substituted, nor too large a part of the working capital be used for the purchase of real estate on long term loans. At least 30 per cent of the investments should consist of loans repayable before the next harvest. It is also recommended that the loan banks deposit their surplus cash with the central banks and require the central banks to use the most scrupulous diligence in the management of the amounts intrusted to them. Lastly, there should be a rigorous inspection and energetic measures taken to correct any faults at the time of their discovery.

The experience of animal insurance societies in Holland (*Jour. Bd. Agr. [London]*, 20 (1913), No. 7, pp. 628, 629).—A brief financial and statistical account of the cattle, horse, and pig insurance societies of Holland.

Ontario's white coal, F. A. GABY (*Ann. Rpt. Agr. Soc. Ontario*, 13 (1913), pp. 29-34, figs. 5).—The author describes methods of organizing the farmers so that they can obtain electricity from large corporations to use in farm industries.

Farm efficiency, K. C. LIVERMORE (*Cornell Countryman*, 11 (1914), No. 4, pp. 121-127, figs. 3).—By representing the size, production, diversity, and work rate on an average farm by 100, the efficiency of an individual farm can be obtained by comparisons. The author illustrates his method by comparing 6 farms with the average conditions, pointing out the good and bad features of each farm.

[Agricultural statistics] (*Statist. Abs. Brit. Self-Gov. Dominions [etc.]*, 50 (1898-1912), pp. 310-372).—The acreage and production of the principal farm crops, together with the number of live stock, are given for a series of years for the several British self-governing dominions, crown colonies, possessions, and protectorates. See also a previous note (E. S. R., 27, p. 92).

Agricultural statistics of Austria (*Statist. Rückblicke Osterr.*, 1913, pp. 23-31, 42).—Statistics are given showing the areas devoted to cultivated land, meadows, gardens, pastures, and woods for 1897, and the acreage and harvest

of the principal farm crops for 5 year periods beginning with 1877 and ending with 1912. The number of live stock for various years beginning with 1850 is shown by statistical tables. Statistics are also given showing the production of beer, wine, sugar, and tobacco.

Agricultural statistics of Prussia (*Preuss. Statis., 1911, No. 230, pp. LII+26*).—Data are given showing the area and production of the principal farm crops by Provinces for each year from 1900 to 1911, inclusive.

[**Live stock in Germany**] (*Internat. Inst. Agr. [Rome] Bul. Agr. and Com. Statis., 5 (1914), No. 1, p. 9*).—In 1912 the number of horses was 4,523,059; cattle 20,182,021, of which 10,944,283 were cows and heifers; sheep 5,803,445; swine 21,923,707; goats 3,410,396; and poultry of all kinds 82,702,030.

[**Live stock statistics in the Union of South Africa**] (*Internat. Inst. Agr. [Rome], Bul. Agr. Statis., 4 (1913), No. 12, p. 435*).—Between 1904 and 1911 the number of cattle increased from 3,500,453 to 5,796,949; horses from 449,539 to 719,414; asses from 141,930 to 336,710; sheep from 16,322,503 to 30,656,659; goats from 9,770,545 to 11,762,979; and swine from 679,084 to 1,081,600. Mules decreased from 134,734 to 93,931.

AGRICULTURAL EDUCATION.

Report of the department of agriculture of Sweden, 1911 (*K. Landtbr. Styr. [Sweden] Underdåniga Ber. 1911, pp. [VI]+540+IX*).—This report contains the usual accounts of the various agencies for the promotion of Swedish agriculture, including reports of the work of agricultural, horticultural, dairy, and housekeeping schools, and the dairy, chemical, and seed control stations.

Government aid to agriculture in the Netherlands, 1913 (*Intervention du Govt. en faveur de l'Agriculture dans les Pays-Bas. The Hague: Dir. Agr., 1913, pp. 171, figs. 42*).—A detailed account is given of the organization of the Direction of Agriculture of the Department of Agriculture, Industry, and Commerce, and of government measures for the encouragement of agriculture in general and in special fields, including the agricultural education institutions and courses of all grades, and agricultural experiment stations, fields, and gardens.

Agricultural education (*Ensino Agronomico. Rio de Janeiro: Min. Agr., Indus. e Com., 1911, pp. 87*).—The text is given of a decree of October 20, 1910, together with regulations, establishing a system of agricultural education in Brazil, to include instruction in agriculture, veterinary medicine, zootechny, and rural industries. The agricultural instruction comprises the following: Higher instruction to be given in a higher school of agriculture and veterinary medicine in the federal district in a 4-year course, secondary or theoretical-practical schools of agriculture with 3-year courses, practical schools of agriculture with 3-year courses, agricultural apprentice schools with 2-year courses, elementary agricultural instruction, special schools of agriculture, agricultural home economics schools, special short courses, itinerant agricultural courses, and agricultural conferences and lectures. This instruction is supplemented by experiment stations, experiment and demonstration fields, experiment farms, stations for testing agricultural machinery, and zootechnical and meteorological stations. The object, organization, and equipment of these are outlined.

Horticultural training (*Gartenflora, 62 (1913), Nos. 16, pp. 349-354; 17, pp. 373-383; 19, pp. 413-422*).—These articles include (1) an address by Dr. H. Thiel dealing with general considerations in the organization of instruction in horticultural institutions, (2) an address by H. R. Jung on Horticultural Apprentice and Continuation Instruction, and (3) a discussion of these subjects by leading horticulturists at the second German Horticultural Day in Breslau in July, 1913.

The Seaman A. Knapp school and farm (*Peabody Col. Bul., n. ser., 1 (1913), No. 2, pp. 16*).—This bulletin deals with the scope and character of the work to be undertaken by this school of country life, which it is planned to develop as a clearing house for the rural communities of the South, and a center for the exchange of ideas and information practically tested.

The National School of Streams and Forests, P. GUINIER (*Vie Agr. et Rurale, 2 (1913), No. 35, pp. 224-230, figs. 6*).—In this article the author reviews the history and describes the buildings and equipment, admission requirements, regime, personnel, and curriculum of the National School of Streams and Forests at Nancy in France.

Suggestions for agricultural high schools, P. B. BARKER (*Lincoln, Nebr.: Dept. Pub. Instr., pp. 12*).—These suggestions deal with the division of the high school land into plats for demonstration purposes, soil apparatus, and a list of soil books and soil references for the agricultural library.

The present organization of agricultural high school instruction in Germany, E. FEIGE (*Naturwissenschaften, 1 (1913), No. 40, pp. 958-960*).—The author discusses the present organization of agricultural high school instruction in Germany.

Agricultural instruction in the army, R. HANNE (*Mitt. Deut. Landw. Gesell., 28 (1913), No. 47, pp. 636-642*).—The present status of agricultural instruction in the German army, organized 5 years ago, is discussed in accordance with information obtained from 120 replies to a circular letter of inquiry sent to agricultural instructors and from reports of chambers of agriculture.

Progress in the organization of agricultural instruction in the army and its results in the kingdom, BRANDENBURG (*Mitt. Deut. Landw. Gesell., 28 (1913), No. 27, pp. 393-395*).—The author surveys the present status of agricultural instruction in the army in Germany, and concludes that while opinions as to the value and results of this instruction are not yet everywhere crystallized the efforts that have been put forth have proved correspondingly beneficial.

Agricultural instruction for women in England, Mlle. J. MORIN (*Bol. Agr. Téc. y Econ., 5 (1913), No. 57, pp. 823-835*).—An account is given of instruction in gardening and nature study in the elementary and secondary schools of England, the instruction in the colleges of horticulture for women at Studley and Swanley, and the agricultural instruction in the University College of Reading.

French itinerant schools of agricultural home economics, A. DUCLOUX (*Vie Agr. et Rurale, 2 (1913), Nos. 32, pp. 149-150; 38, pp. 305-308; 43, pp. 438-440, figs. 3*).—The author gives an account of the history, curriculum, present status, results, and future of itinerant schools of home economics in France.

Farm women's institutes in America (*Dept. Agr. and Tech. Instr. Ireland Jour., 14 (1913), No. 1, pp. 31-40*).—An account is given of the organization and aims of the farm women's movement in Canada and the United States.

Women's institutes in Ontario, 1913 (*Rpt. Women's Insts. Ontario, 1913, pt. 1, pp. 120*).—This report contains the proceedings of the annual convention held in November, 1912, together with a few selected papers, statistics for the year ending with May, 1913, and list of officers for 1912-13.

Farmers' institutes of Ontario, 1913-14 (*Rpt. Farmers' Insts. Ontario, 1913, pt. 2, pp. 51*).—This report contains announcements of meetings for the winter session of 1913-14, and a statistical statement of the local farmers' institutes throughout the Province for the year ended May 31, 1913.

North Wales egg and poultry demonstration train, April 23 to May 6, 1913, E. BROWN (*Jour. Agr. Organ. Soc., 7 (1913), No. 3-4, pp. 83-94*).—The organization, equipment, staff, etc., of the train are outlined.

A plan for a rural community center, A. R. MANN (*Cornell Col. Agr. Ext. Circ. 1, 1913, pp. 16, figs. 7*).—This circular shows how a rural community center may be developed in the open country, village, and the smaller town and city. Under the plan proposed a piece of land about 20 to 30 acres in extent is laid out in somewhat the same way as the usual fair grounds, but to be used as a public park and to be open at all times, also a grove for picnics, summer gatherings, and shelter purposes, a consolidated or combined elementary and high school building in or near the grove, athletic grounds, experiment or demonstration plats, and a building that can be heated for year-around meetings and exhibits.

Farmers' clubs, A. D. WILSON (*Univ. Minn., Dept. Agr., Ext. Bul. 46, 1913, pp. 8, figs. 5*).—This bulletin sets forth in a simple way some of the things that farmers' clubs are doing for communities in which they exist and some of the things they may do, and points out the steps necessary for organizing and conducting a farmers' club.

Addresses given at the Rural Life Conference, Middlebury College, July 7–13, 1913, with rural life bibliography, R. MCFARLAND (*Middlebury, Vt., 1913, pp. 48*).—The papers presented at this conference included, among others, The Importance of the Rural Problem, by R. J. Sprague; Marketing of Farm Products, by E. S. Brigham; Rural School Improvement, by J. M. Thomas; New Activities in Rural Education, by F. E. Howard; Rural Libraries, by Rebecca W. Wright; Play and Athletics for Rural Vermont, by L. A. Morhous; and The Work of the Grange, by W. N. Cady.

Materials and methods in high school agriculture, W. G. HUMMEL and BERTHA R. HUMMEL (*New York, 1913, pp. XI+385, pls. 22*).—This book has been prepared to meet the needs of persons interested in the introduction or in the teaching of agriculture in high schools, towns, cities, or rural communities where large numbers of students are drawn from the farming population.

In addition to outlining the agricultural course as a whole for the high schools of the type mentioned, the book gives helpful suggestions as to the selection of suitable materials, teaching methods, and equipment for the various subjects of the course. Practicums and references for collateral reading follow each chapter.

Nature study lessons (*Cornell Rural School Leaflet, 7 (1913), No. 2, pp. 213–240, figs. 17*).—This leaflet contains suggestions on Corn Day in the school, and lessons on cows, trees, and birds.

Principles and practice of school gardening, A. LOGAN (*London, 1913, pp. XV+313, pl. 1, figs. 102*).—In this text-book, intended as a guide for teachers and pupils in school gardening, the author has included the matter which after 5 years of experience in teaching the subject, he considers to be most usable from an educational point of view and most essential from the standpoint of horticulture and rural science. The method of presentation adopted, which has been found suitable in dealing with pupils between 12 and 16 years of age, is mainly experimental and practical. "While the text of the volume aims at the analysis of operations with a view to the examination of the laws of nature upon which each is based," the exercise appended to each chapter for the purpose of correlating school gardening with other subjects in the curriculum, encourage the student to extend his intellectual horizon, to regard these operations in their world relation, etc.

Suggestions for household exhibits (*Iowa State Col. Agr. Ext. Dept., Home Econ. Circ. 4, 1913–14, pp. 8, pl. 1*).—Suggestions are made for the arrangement of exhibits of household materials, and score cards are given for use in judging homemade food products and needlework and other textiles.

NOTES.

Idaho University.—Press reports announce that Dr. Melvin A. Brannon, dean of the college of liberal arts at the University of North Dakota since 1911, has been appointed president.

Illinois University.—A traveling school of fruit growing was conducted from February 2 to February 21 by the division of pomology, in cooperation with the Southern Railway.

Louisiana University.—A high school rally will be held on May 1 and 2 at which contests will be held in forestry, domestic science, corn and live stock judging, etc. Each contestant is to pay an entry fee of \$1, the fund thus collected being used for reducing the railway expenses of the more distant schools.

Montana College.—The registration at the annual farmer's week showed an increase of 60 per cent over the previous year and a total of 275 students. There were about 25 speakers in addition to the members of the college faculty.

Nebraska Station.—H. A. McComb, a 1902 graduate of the university, has been appointed assistant in horticulture at the North Platte substation beginning February 15.

Cornell University.—The landscape art building is being occupied and the contract has been let for the new agronomy building. A new greenhouse, 34 by 40 feet, has been completed for use in vegetable gardening and will form the beginning of a range to include from 12,000 to 15,000 square feet of space.

The total registration for the various farmer's week programs was 2,589 and the total attendance is estimated at about 3,500. Nearly 400 lectures and demonstrations were given and 16 conferences and conventions were held.

The department of pomology has leased a tract of 8 acres of land near Fort Byron for experiments in orchard renewal.

Vermont University.—The extension service is organizing 5-day extension schools of agriculture, arrangements having been completed for about 10 of these schools. The first of these was held in South Barre with an average daily attendance of 54.

Virginia Station.—The state legislature has increased its annual appropriation to the station from \$10,000 to \$16,000. The State Board of Agriculture has also increased its allotment for station work to \$7,500 annually, this money being derived from the fertilizer tag tax, and the work being conducted under the direction of the station. These funds are used to conduct experiments with farm crops and fruit and in soil fertility investigations elsewhere than at Blacksburg, 12 counties now being represented. The additional amounts will be used to study problems in peanut and cotton culture in Nansemond County and to begin soil fertility and crop rotation tests in Culpeper County.

Virginia Truck Station.—H. S. Garrison resigned February 1 as superintendent of the Tasley substation to accept a position with the Bureau of Plant Industry of this Department.

Washington College and Station.—At a recent meeting of the board of regents, there was organized a department of dry-land demonstration and experiment

for work in the semiarid portion of the State. It is proposed that the members of the staff advise and assist farmers in that section, giving attention to demonstration work connected with the production of crops adapted thereto and other problems bearing on dry-land agriculture. In order that the work of the department may be as closely correlated as possible with that of the station and the State Bureau of Farm Development, the director of the station has been made director of the department. H. E. Goldsworthy, a graduate of the college, who has had considerable experience in dry-land farming in Alberta, has been appointed vice-director with headquarters at Lind.

Byron Hunter, formerly of the Office of Farm Management of this Department, has been appointed vice-director of the Bureau of Farm Development, the director of the station being its director. This bureau has charge of the county agricultural work in the State in cooperation with this Department.

William D. Foster, for a number of years superintendent of the college farm, died January 25.

Wisconsin University and Station.—H. E. Lothe, D. V. M., has been appointed instructor in veterinary science in the college of agriculture and assistant in veterinary science in the station. M. H. Crissey has been appointed assistant in agricultural economics and executive secretary in the college and station.

Agricultural Education in Canada.—At the request of the minister of education, Queen's University, Kingston, has established the new degree of bachelor of science in agriculture. The course covers four years, of which the first two are to be spent in residence at the university and the remaining two at the Ontario Agricultural College. In order to increase their knowledge of practical agriculture, candidates for the degree will be expected to work during the summer vacation between the third and fourth years of the course, either on the farm of the agricultural college or on some other approved farm. At the end of each of the two years taken at the agricultural college the government will give a scholarship of \$100 to each candidate recommended by the president of the college.

The department of education will accept the degree of B. S. Agr. as the academic qualification for a specialist's certificate in both science and agriculture and for a public school inspector's certificate. The former certificate will be granted after a year's professional training at the faculty of education of either Queen's University or the University of Toronto. The holder will be regarded as qualified to teach both science and agriculture in a high school, continuation school, or collegiate institute, and each county representative, in addition to his usual duties, will conduct under the school board concerned, classes for farmers and farmers' sons throughout the county.

It is announced that as soon as the new class of specialists is available, the government will also make liberal grants for maintenance and increase of teachers' salaries for the encouragement of secondary school classes in agriculture. The payments to the teachers, however, will obligate the teacher to teach at least two years in the Province of Ontario.

The new buildings of the Manitoba Agricultural College, located on a site of 1.100 acres just south of Winnipeg, were sufficiently completed to permit of their use in the fall of 1913. The group as a whole will cost \$5,000,000 and will require from 2 to 3 years additional for its completion.

The new college of agriculture of Saskatchewan University is offering a 4-year course leading to the degree of B. S. in Agr., and a 3-year course leading to the certificate of Associate in Agr. The first class in agriculture, consisting of 65 students, entered last fall, nearly all of whom matriculated in the 3-year course.

The Province of Alberta is undertaking a new form of instruction in Canada in opening 3 schools of agriculture, viz, at Claresholm, with W. J. Stephens,

principal, to cover southern Alberta and deal with education best suited under dry farming and irrigation conditions; at Olds, with W. J. Elliott, principal, which will look after the interests of central Alberta where the soil is a heavy black loam; and at Vermilion, with A. E. Howes, principal, to deal with northern conditions. Tuition in these schools will be free and the 2-year course will approximate very closely to the first 2 years of the regular agricultural college course for the degree of B. S. in Agr. Domestic science courses will also be offered. In addition to the principal there will be at least two professors at each school whose time during the summer will be devoted to extension work and getting in touch with the farm homes. The schools will be operated under a board composed of a body of practical farmers.

An act has been passed providing for the establishment of agricultural schools at such places in the Province of New Brunswick as may be decided upon by the Lieutenant-Governor-in-Council, who is also authorized to purchase such lands and erect such buildings as he may deem necessary for the purpose. The curriculum of the schools will include agriculture, horticulture, forestry, care and management of farm animals, butter and cheese making, manual training, and kindred subjects, as well as the elements of sciences bearing on these subjects. The schools will be largely under the management of the New Brunswick department of agriculture, which will regulate the conditions of admission, fix tuition fees, arrange courses of study, supervise the conduct and work of students, grant certificates of proficiency or other awards, etc. The Lieutenant-Governor will appoint the staffs of the schools and authorize the expenditures to be made by the department of agriculture for these schools.

The Province of Prince Edward Island has provided a summer school of agriculture and nature study for the teachers in its rural schools. The courses are given in the building of the Prince of Wales College at Charlottetown, and are of two weeks' duration. An attendance of over 250 was enrolled in 1913, out of a total of 590 teachers on the Island. The traveling expenses and a portion of the living expenses of these students were borne by the Province.

New Journals.—*The American Journal of Tropical Diseases and Preventive Medicine* is being published monthly at New Orleans as the official organ of the American Society of Tropical Medicine. The initial number contains, among other original articles, an account of The Species of Anophelines Concerned in the Transmission of Human Malaria by F. Knab, and one On the Adult Forms of *Trypanosoma americanum* in Naturally Infected Animals by F. M. Johns. It also contains reviews, notes, etc.

The Indian Journal of Medical Research is being published quarterly as the official organ of the Indian Research Fund Association. It is to contain original papers and notes on various topics directly or indirectly connected with medical and sanitary science, including hygiene, sanitary engineering, sanitary laws, statistics, bacteriology, parasitology, entomology, etc. Several of the articles in the initial number are of particular interest to entomologists.

The Canadian Department of Agriculture is publishing the *Agricultural Gazette of Canada* with J. B. Spencer as editor. This will be the official organ of the department and will be issued monthly in both English and French editions. The initial number contains an account of the department and its work, the text and other data regarding the agricultural instruction act of June 6, 1913, short accounts of the various provincial departments of agriculture, statistics as to the attendance of students in agriculture and veterinary courses for the current year, etc.

Boletim do Ministerio da Agricultura, Industria, e Commercio is being published at Rio de Janeiro and will contain official announcements of the Brazilian

Government relating to agriculture, memoirs and original articles, translations, reprints, statistics, and notices relating to both Brazilian and foreign agriculture. The ministry is also issuing a monthly entitled *Superintendencia da Defesa da Borracha*, which contains announcements, statistics, notes, and related matter of interest to the rubber industry.

The American Home Economics Association has established in the *Journal of Home Economics* a Housekeepers' Department. This is designed to bring to the housekeeper's attention progress made in the laboratory and elsewhere in matters pertaining to food and other home problems, and to interpret for her guidance the results of research.

A quarterly *Journal of the American Society of Agronomy* has replaced the annual *Proceedings* of the Society. It will contain technical papers of some length, brief articles, and personal and scientific notes and news items.

The Veterinary Alumni Quarterly is being published by the Veterinary Alumni Association of the Ohio State University. The initial numbers contain several original articles along veterinary lines.

The Mississippi Agricultural Student is a new quarterly devoted to the advancement of agricultural education, and published by the School of Agriculture of the Mississippi College.

The British Ecological Society has established *The Journal of Ecology* as its official organ, to include general articles, reviews of current work, notes, bibliographies, etc.

Mitteilungen der Landwirtschaftlichen Lehrkanzeln der k. k. Hochschule für Bodenkultur is being published in Vienna, and contains original articles from this and other institutions.

Zeitschrift für Pflanzenzüchtung, a joint organ of the German and Austrian Societies for the Promotion of Plant Breeding, is being published in Berlin. It contains original articles, abstracts, notes, etc.

Miscellaneous.—A large bequest, stated at \$1,250,000, is announced in the will of the late W. Gibson of London and Belfast to institute a scheme for providing sons of farmers in Down and Antrim counties, Ireland, with educational advantages. No further details are as yet available.

Dr. G. Rubland, secretary of the International Agricultural Union, and well known for his writings on agricultural economics, notably those relating to the marketing of cereals and agricultural credit, died January 5 at the age of 54 years.

Julius Lenkowsitch, author of the well-known treatise on Chemical Technology and Analysis of Oils, Fats, and Waxes and other works died September 16, 1913, at the age of 56 years.

Science announces a gift of \$30,000 by Mrs. Russell Sage to the Joseph Slocum Agricultural College of Syracuse University.

L. G. Sutton has contributed \$5,000 toward the fund for buildings and laboratories for agricultural and other departments at University College, Reading.

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VOL. XXX.

ABSTRACT NUMBER.

No. 6.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

An investigation of phytin, R. H. A. PLIMMER and H. J. PAGE (*Biochem. Jour.*, 7 (1913), No. 2, pp. 157-174).—Data are given regarding the determination and amounts of phosphorus, calcium, magnesium, carbon, and hydrogen in commercial phytin and phytin obtained from wheat bran.

It is shown that the inorganic phosphates in phytin can be easily determined by precipitation with a solution of ammonium molybdate in seminormal nitric acid at room temperature. The amount of calcium present can be estimated by precipitation as calcium oxalate, but it is much more easily ascertained by precipitation as calcium sulphate. Magnesium can be determined as magnesium pyrophosphate. Much difficulty was experienced in the removal of the calcium from phytin in the preparation of phytic acid. This fact has already been noted by other authors. Inositol was not obtained quantitatively as a result of hydrolyzing phytic acid with an acid. The authors, like Levene, are inclined to believe that another organic constituent is present in phytin. The work on the production of inositol by the hydrolysis of phytic acid is to be continued. A concise review of work previously published on this topic is included.

The constitution of the luteins, C. SERONO (*Arch. Farmacol. Sper. e Sci. Aff.*, 14 (1912), No. 11, pp. 509-511).—A criticism of the methods employed and the results obtained by other workers in a study of the lutein of hen's egg yolk (*E. S. R.*, 27, p. 611). It defends previous results obtained by the author (*E. S. R.*, 26, p. 503), which disagree with those criticized.

Comparison of methods for the preparation and determination of cholesterol, J. S. HEPBURN (*Abs. in Biochem. Bul.*, 2 (1913), No. 7, pp. 467, 468).—These studies, which were made with material obtained from brain tissue and gall stones, resulted in showing that the iodine reagent used in fat analysis can not be used for the volumetric determination of cholesterol. The methods compared were those of Hübl, Hanus, and Wijs. The lowest results were given by the Hübl method. "There was a marked tendency, especially with the Hanus and Wijs methods, for the iodine number to become higher the greater the excess of the iodine reagent. However, the iodine numbers were not simple multiples of 65.7, hence the presence of a second double bond in cholesterol is doubtful."

In the quantitative determination of cholesterol as free alcohol it was found that the modifications of Ritter's method were unsatisfactory. "When carbon dioxide was used to neutralize the excess of sodium ethylate, divergent results

were obtained: 99.9 per cent and 92.43 per cent of the cholesterol taken was recovered. When hydrochloric acid was used to neutralize the excess of sodium ethylate, the results were still less satisfactory, 64.34 to 89.1 per cent of the cholesterol taken being recovered. The gravimetric determination as cholesteryl benzoate is not quantitative; only 24.29 to 61.79 (average 42.86 per cent) of the cholesterol taken was recovered. The gravimetric determination of cholesterol as the free alcohol by Cappenberg's method gave excellent duplicates; 94.47 and 94.37 per cent of the cholesterol taken was recovered. The gravimetric determination of cholesterol as digitonin cholesterid was the most accurate and most satisfactory of the methods studied. From 93.63 to 103.02, average 97.37 per cent, of the cholesterol taken was recovered."

Biochemical synthesis of glucosids from polyhydric alcohols: Glucosids from glycerol and glycol, E. BOURQUELOT and M. BRIDEL (*Compt. Rend. Acad. Sci. [Paris]*, 157 (1913), No. 8, pp. 405-408).—A report of a study of the production of glucosids from glycol and glycerol. The reaction proceeds more quickly with the former. The synthesizing enzyme came from bottom fermentation yeast.

On the nature of the sugars found in the tubers of arrowhead, K. MIYAKE (*Jour. Biol. Chem.*, 15 (1913), No. 2, pp. 221-229).—This paper embodies the results of a study on the nature of the sugars found in arrowhead tubers (*Sagittaria sagittifolia forma sinensis*), and forms a part of an investigation on the sugars contained in the underground reserve organs of plants. The reducing sugars present in arrowhead tubers were found to consist of both glucose and fructose. It was not definitely decided whether or not galactose was present. A nonreducing sugar believed to be raffinose was found, but maltose, pentose, and mannose, free or combined, were not noted.

The starch content of cassava roots, A. W. K. DE JONG (*Dept. Landb., Nijv. en Handel [Dutch East Indies], Meded. Agr. Chem. Lab.*, No. 5 (1913), pp. 18).—A study of the composition of cassava roots. Although a high specific gravity of the root may indicate a high starch content, it has been found that this is not always true. More accurate figures were obtained from the determination of the total solids.

Notes on the chemical nature of the "tannin masses" in the fruit of the persimmon, E. D. CLARK (*Biochem. Bul.* 2 (1913), No. 7, pp. 412-418).—"Tannin masses from the fruit of the persimmon, by hydrolysis with weak acid or alkali, yield tannin, phloroglucinol, and considerable insoluble colloidal residue. Hydrolysis of such tannin masses does not produce hexose or pentose.

"The nature of the union between the tannin and phloroglucinol is unknown, but it is probably similar to that of the phloroglucin-tannoids in various plants.

"The colloidal residue that resists hydrolysis seems to be a cellulose-like substance which readily forms gelatinous masses with water or alkaline solutions. Quantitative studies on large amounts of this third substance are desirable.

"In the presence of phloroglucinol, the ferric chlorid test for tannin is unreliable.

"A study of the conditions necessary for the formation, and also the hydrolysis, of the phloroglucinol-tannin combination might help to explain the nature of the ripening process in persimmons."

See also previous notes by Lloyd (*E. S. R.*, 25, p. 28; 26, p. 564.)

The occurrence of barium in tobacco and other plants, J. S. McHARGUE (*Jour. Amer. Chem. Soc.*, 35 (1913), No. 6, pp. 826-834).—The presence of barium was noted in the leaves, base, stalks, and roots of tobacco plants gathered in 1910, 1911, and 1912. The amount found in the dry leaves was on the average in 7 samples 0.0399 per cent as barium sulphate (maximum 0.074, minimum 0.0096 per cent); in the stalk the average for 8 samples was 0.0396 per cent

(maximum 0.068, minimum 0.016 per cent); base (1 sample) 0.15 per cent; and root (1 sample) 0.115 per cent.

The barium sulphate content of other plants and materials which were examined was as follows: Corn stover, in dry plant, 0.014 per cent; corn stalks (stubs ad base) in ash, 0.055; corn roots and rootlets, in ash, 0.022; soy beans, best white (whole plant), in dry plant, 0.005; soy beans, China (beans), in dry plant, 0.0014; alfalfa (as cut), in dry plant 0.0132; hemp, in dry plant, 0.0036; burdock root, in ash, 0.44; blue grass, in dry plant, 0.0078; clover, in dry plant, 0.008; Irish potatoes, in ash 0.016; hazelnut shells, in dry plant, 0.007; sycamore stump (last growth, next to bark), in ash, 0.039; banana stalk (after fruit had been removed), in dry plant, 0.049; coal, in air dry sample, 0.014; soil, dry, 0.08; and soil (coal measures), in dry soil, 0.012 per cent. No barium was found in corn (plant, ear, and cob), soy beans (whole plant), poke root, wheat (grain), hickorynut shells, sycamore stump (heart), or limestone rock.

In contrast to Crawford's findings with plants (E. S. R., 20, p. 280), 2 tobacco plants yielded barium when extracted with water. This barium is probably in combination with organic acids, consequently "in tobacco, a plant whose barium content has not been previously reported upon, the barium varies from the normal content of other plants, both wild and cultivated, to approximately twice the maximum reported in locoweed. . . . The occurrence of barium in the live cells of the higher plants suggests that possibly this metal may function in metabolism."

See also previous note (E. S. R., 27, p. 580).

About a hemagglutinin in the Euphorbia, M. VON EISLER and L. VON PORTHEIM (*Centbl. Bakt. [etc.]*, 1. Abt., Orig., 66 (1912), No. 2-4, pp. 309-316; *abs. in Centbl. Bakt. [etc.]*, 1. Abt., Ref., 55 (1912), No. 19, p. 581).—In the milky juice of the Euphorbia hemagglutinins were often noted. These substances were present not only in the seed but also in the vegetative parts of the plant.

Enzymatic cleavage of hippuric acid by mold fungi, A. W. Dox and R. E. NEIDIG (*Hoppe-Seyler's Ztschr. Physiol. Chem.*, 85 (1913), No. 1-2, pp. 68-71; *abs. in Science, n. ser.*, 37 (1913), No. 957, p. 683).—"The formol titration method of Sörenson was found admirably adapted to a study of enzymatic cleavage of hippuric acid. All of the mold species examined [*Aspergillus niger*, *A. fumigatus*, *A. clavatus*, *Penicillium camemberti*, *P. roqueforti*, and *P. expansum*] contained an enzym capable of hydrolyzing 80 per cent or more of the hippuric acid in the presence of toluol. The age of the culture (1 to 4 weeks) seemed to have little influence upon the amount of enzym. The enzym was produced in all cases in the absence of the corresponding zymolyte from the medium."

Taka-diastase was also studied in this connection.

Cleavage of pyromucuric acid by mold enzymes, A. W. Dox and R. E. NEIDIG (*Biochem. Bul.* 2 (1913), No. 7, pp. 407-409).—As none of the heterocyclic analogues of hippuric acid have been studied with reference to their cleavage an investigation was made with pyromucuric acid and taka-diastase, emulsin, and press juices from the following species of mold: *Aspergillus fumigatus*, *A. niger*, *A. clavatus*, *Penicillium roqueforti*, *P. camemberti*, *P. expansum*, and *Fusarium oxysporum*. As a measure of the cleavage the formol-titrimetric method was used. The amount of cleavage was less than that which was previously noted with hippuric acid. Figures relative to the formation of ammonia are also included, but ammonia is not regarded as a direct cleavage product of pyromucuric acid.

The enzymes of washed zymin and dried yeast (Lebedew): I, Carboxylase, A. HARDEN (*Biochem. Jour.*, 7 (1913), No. 2, pp. 214-217).—"Zymin and dried yeast (Lebedew) after being freed from coenzym by washing, and thus rendered incapable of fermenting glucose, readily decompose pyruvic acid into carbon dioxid and acetaldehyde, provided that the acidity of the solution is kept low."

Did von Wittich antedate Ostwald in the definition of enzym action? W. N. BERG (*Biochem. Bul.*, 2 (1913), No. 7, pp. 441-445).—A historical discussion in regard to priority.

The precipitation of enzymes from their solutions by moist aluminum hydroxid, W. H. WELKER and J. MARSHALL (*Jour. Amer. Chem. Soc.*, 35 (1913), No. 6, p. 822).—The enzymes studied were peroxidase (water extract of potato), oxidase (water extract of potato), amylase (saliva), pepsin (water solution of commercial pepsin), pepsin (0.2 per cent hydrochloric acid solution of commercial pepsin), rennin (water solution of commercial rennin), trypsin (water solution of commercial trypsin), trypsin (0.5 per cent Na_2CO_3 solution of commercial trypsin), trypsin (30 per cent alcohol extract of pancreas), trypsin (30 per cent alcohol extract of pancreas plus an equal volume of 1 per cent Na_2CO_3 solution), amylase (30 per cent alcohol extract of pancreas) and lipase (30 per cent alcohol extract of pancreas).

All the enzymes, with the exception of amylase, were completely removed from the solution by aluminum hydroxid. "The only zymogen studied was pepsinogen (prepared by extracting the mucous membrane of the stomach of pigs with 50 per cent glycerol solution), which in 10 per cent and in 25 per cent glycerol solution is removed quantitatively only with the greatest difficulty."

The precipitation of colloids by means of aluminum hydroxid, J. MARSHALL and W. H. WELKER (*Jour. Amer. Chem. Soc.*, 35 (1913), No. 6, pp. 820-822).—"The following solutions were subjected to the treatment with aluminum hydroxid. In each case the colloidal material was removed absolutely quantitatively: Copper, gold, platinum, sulphur, nickel sulphid, cobalt sulphid, cupric hydroxid in NaOH, Prussian blue, Congo red (indicator solution), azolitmin, litmus (neutral), litmus (red), litmus (alkaline), starch paste, soluble starch, erythroextrin, starch iodid, water emulsion of fat (mechanical entangling of fat globules), soap, emulsion of fat in soap solution (including fat and soap), egg albumin, globulin (edestin in 5 per cent NaCl), gelatin, casein (in one-half saturated lime water) glutenin (in 0.5 per cent Na_2CO_3), nucleoprotein (in 0.5 per cent Na_2CO_3), gliadin (in 70 per cent alcohol), ovomucoid, acid metaprotein (in 0.1 per cent HCl), primary proteose, secondary proteose, milk (including fat and protein), and blood serum (protein).

"The use of aluminum hydroxid, therefore, would appear to be well adapted for preparing oxyhemoglobin from erythrocytes because it removes protein from the blood serum mingled with the dissolved sedimented erythrocytes and also the precipitable protein of these cells themselves, yielding a filtrate from which, as we have found by experiment, oxyhemoglobin more readily crystallizes and in a much purer state than by any other known method."

The direct determination of elementary nitrogen with the aid of calcium carbid, B. NATUS (*Ztschr. Analyt. Chem.*, 52 (1913), No. 5, pp. 265-292, fig. 1; *abs. in Chem. Ztg.*, 37 (1913), No. 68, *Repert.*, p. 310).—For the absorption of the nitrogen a mixture consisting of 10 parts of technical carbid and 1 part of calcium chlorid, which was powdered and previously heated to redness, is used. The absorption takes place in a porcelain tube heated to redness, and for displacing, hydrogen of known nitrogen content is passed through the tube. The nitrogen is then determined in the carbid mixture by Wilfarth's modification

of Kjeldahl's method, which consists of decomposing the mixture with fuming and concentrated sulphuric acid and 1 drop of mercury. The error with dry gases was on an average 0.75 per cent.

The advantages of the Wilfarth method over the Kjeldahl and phenol-sulphuric acid methods are shown.

A micro-Kjeldahl apparatus, M. MORSE (*Abs. in Biochem. Bul.*, 2 (1913), No. 7, pp. 457, 458, pl. 1).—This is a combination of the apparatus designed by Fritz Pregl for determining nitrogen in small quantities of material and the fume absorber devised by Folin and Denis noted below. The apparatus is regarded as equally serviceable with that devised by Sy (*E. S. R.*, 28, p. 311).

An apparatus for the absorption of fumes, O. FOLIN and W. DENIS (*Jour. Biol. Chem.*, 11 (1912), No. 5, pp. 503-505, figs. 2).—An inexpensive apparatus for this purpose is described and illustrated.

A modification of a method for examining fermentation gases, W. FRIEBER (*Centbl. Bakt. [etc.]*, 2. Abt., 36 (1913), No. 19-25, pp. 438-443, fig. 1).—What is claimed to be an improvement on Burri and Dügge's apparatus and method^a is described.

The volumetric determination of manganese in rock, slags, ores, and spiegel, F. J. METZGER and L. E. MARRS (*Jour. Indus. and Engin. Chem.*, 5 (1913), No. 2, pp. 125, 126).—This is an application of a method previously noted (*E. S. R.*, 24, p. 211) to the substances stated above.

Importance of the error of analysis in questions relating to the nitrogen economy of arable soils, T. PFEIFFER and E. BLANCK (*Landw. Vers. Stat.*, 78 (1912), No. 5-6, pp. 367-374; *abs. in Jour. Chem. Soc. [London]*, 104 (1913), No. 604, I, p. 238).—"A final attempt was made to obtain a satisfactory nitrogen balance with the experimental soils at Breslau. Six plats (9 square meters each) were selected, which had given similar amounts of crops during 2 years, and from each plat 5 samples of soil were taken. Ten or 12 nitrogen estimations were made with each sample. The experimental error was found to be ± 0.00086 , which would correspond with 25.8 kg. of nitrogen per hectare to a depth of 25 cm. if the weight of the soil is taken as 3,000,000 kg., or 32.2 kg. if the total weight of the soil is taken as 3,750,000 kg. As this number has to be multiplied by 3, it would only be possible to show a difference exceeding 77.4, or 96.6 kg. of nitrogen per hectare. With fewer samples or analyses the error would, of course, be greater. It must also be borne in mind that the nitrogen of crops is not all derived from the surface soil, but from the subsoil as well."

Note on the volatility of sulphuric acid when used in vacuum drying, H. C. GORE (*Jour. Biol. Chem.*, 15 (1913), No. 2, pp. 259-261, fig. 1).—In the course of some experiments in drying in high vacuum it was noted that sulphuric acid, when used as a desiccant, volatilizes, and when organic substances such as flour are dried, they become darkened in color. In order to determine the extent to which the acid volatilizes, a Hempel desiccator was charged with 7 Petri dishes, placed one above the other, and containing potassium hydroxid, which was then exposed to the action of sulphuric acid for a period of 237 days at room temperature and at a vacuum somewhat less than 1 mm. The amount of sulphuric acid collected in dish No. 1 was 0.2133, in No. 2, 0.044, in No. 3, 0.0169, in No. 4, 0.0061, in No. 5, 0.0072, in No. 6, 0.0026, and in No. 7, 0.0029 gm., or a total of 0.293 gm.

It is stated that lime may be successfully substituted for sulphuric acid.

Direct determination of moisture in foods and miscellaneous materials by distillation, F. MICHEL (*Chem. Ztg.*, 37 (1913), No. 35, pp. 353-355, figs. 4).—

^a *Centbl. Bakt. [etc.]*, 1. Abt., Orig., 49 (1909), No. 2, pp. 145-174.

The method consists of placing the substances under examination in a 300 cc. Erlenmeyer flask containing 150 cc. of a mixture consisting of one-third toluol and two-thirds xylol. Paraffin having a boiling point higher than 100° C. can also be employed, but it has no advantages over the substances mentioned. The mixture is distilled into a 10 cc. graduated collection tube provided with a funnel having a glass stopcock ground in. The amount of water present in the tube is read off, and after applying certain corrections the percentage is computed. Several optional forms of the collecting device are also described.

The results of tests of the method with honey, butter, and milk showed that it gives good results.

A special flask for the rapid determination of water in flour and meal, J. H. Cox (*U. S. Dept. Agr. Bul. 56 (1914), pp. 7, figs. 7*).—A description is given of a special flask, to be used in connection with the Brown-Duvel moisture-determining apparatus (*E. S. R., 24, p. 215*), and designed for commercial work.

The flask may be constructed of either copper or glass. It is double walled and has an inner capacity of about 900 cc. A single-walled flask is not suited for testing finely ground substances and the meal under test very frequently burns badly at the bottom. The method is deemed rapid and accurate.

A detailed description of the entire Brown-Duvel apparatus and method is given, with a special form of graduate for collecting the water distilled from the grain.

Determination of moisture in maize for export, H. J. VEPOND (*Union So. Africa Dept. Agr. Rpt. 1910-11, pp. 395-397*).—A series of tests were carried out to determine the reliability of results obtained by the Brown-Duvel method (*E. S. R., 18, p. 1122*).

In all cases the temperature was allowed to reach 190° C. before the burner was removed. The time required to reach 190° varied from 14 to 20 minutes; the highest temperature obtained after removing the flame was 196°.

The results obtained were compared with check determinations made with ground material and drying in a steam oven. In the case of the ordinary steam oven method there was a slight gain in weight after the material had been dried for 3½ hours, presumably due to an oxidation of the oil present in the cereal.

The results with the Brown-Duvel apparatus were about 2 per cent too high. "The net conclusion is that the Brown-Duvel tester gives very reliable results when worked under uniform conditions, but the figures are rather high under those prescribed by the originators of the method. This can easily be remedied either by deducting say 1 per cent from the readings thus obtained, or by adopting a slightly lower temperature for working. The grain after testing invariably shows a certain amount of blackening, principally in the embryo, indicating the destruction of organic matter.

"Similar tests with soy beans (taking the temperature up to 190° in 20 minutes in such a way that the final temperature reached after removing the flame does not exceed 192°) gave readings about 3 per cent higher than those obtained by the ordinary (steam oven) method."

A few tests were made also to determine the total loss of weight in grinding. The amount of grain weighed off was 48.649 gm. and the amount obtained after grinding was 48.524 gm. "This loss probably includes some of the meal, so that it represents the maximum loss which can be attributed to evaporation of water from the grain during grinding."

Contribution to the study of flour, E. GURY (*Mitt. Lebensm. Untersuch. u. Hyg., Schweiz. Gesdhtsamt., 4 (1913), No. 3, pp. 113-121, fig. 1*).—This is a study of the methods for determining the moisture content of flour, and was made

because many divergent figures for the normal moisture content are given in the literature.

The wheat flours studied came from various sources. The figures obtained in these experiments varied between 12.75 and 15.09 per cent, with one exception, a flour prepared in the laboratory, which showed only 10.83 per cent. The moisture content of barley, rye, oat, rice, and bean flour varied between 10 and 12.8 per cent. In this work a modified Hoffmann method and ordinary petroleum were employed. Toluene when used in the method forms an emulsion.

In order to determine the fixation of water by flour a method was devised which consisted of shaking with water a known weight of flour in a tube graduated in $\frac{1}{16}$ cc., then centrifuging and reading the volume of the sediment. A similar test was made with the same quantity of flour in another tube, but using 95 per cent alcohol instead of water, the difference between the 2 figures constituting what the author terms the water-alcohol difference. This test serves to differentiate many kinds of flour, as the water-alcohol figures for wheat and bean flour are negative and all others (rye, rice, potato, oat, etc.) positive. The higher the negative figure for wheat flour, the better the product.

Nitrogen was determined by the Kjeldahl method as described in the Swiss Food Manual; gluten by König's method. The gluten percentage varied between 6 and 11 per cent when calculated to dry substance. Cellulose was determined by a method which has been employed by the author for cacao products (E. S. R., 28, p. 711). Gliadin was determined according to Abderhalden's method (E. S. R., 23, p. 410) but the results obtained were not accurate.

The determination of water in plant substances with F. Hoffman's moisture-determining apparatus, ST. VON HAYDIN (*Ztschr. Untersuch. Nahr. u. Genussmtl.*, 25 (1913), No. 3, pp. 158-160, fig. 1).—The apparatus, which has proved practical for soils, brewers' grains, malt, hops, barley, flour, potato chips and flakes, starch, and yeast, consists of a copper distilling flask with a thermometer and funnel. Into it is placed 20 gm. of the finely ground substance, 200 cc. of liquid paraffin, and 10 cc. of turpentine. The temperature is raised in 8 minutes to 180° C., and then 10 cc. more of turpentine is added and the temperature raised to 200° for 5 minutes. The water and turpentine pass through a condenser into a graduated cylinder. The number of cubic centimeters in the water layer multiplied by 5 gives the percentage of moisture.

The sample is placed in a copper wire cylinder or holder 5 cm. in diameter, which is lowered into the paraffin. It keeps the substance from sticking to the distilling vessel and does away with filtering after each determination. The determination can be made in 20 minutes when using the holder.

This method with cabbage checked to within an average of 0.3 per cent with the water oven method, which takes 4 hours to obtain constant weight.

Investigations in regard to varieties of egg yolk, with a contribution in reference to the relation of the various kinds of yolk to one another, E. EMMERICH (*Ztschr. Immunitätsf. u. Expt. Ther.*, I, Orig., 17 (1913), No. 3, pp. 299-304).—It has been previously shown by Uhlenhuth and Ottolenghi that egg yolk could be detected with the precipitation method in margarin, noodles, etc. Schütze (E. S. R., 16, p. 845) also worked on this problem. After describing the technique used in preparing the precipitating serum, the author reports tests made with noodles (prepared in the laboratory and purchased in the open market), macaroni, etc. The results show that a highly specific antiserum can be prepared which will detect egg yolk in baked goods, but that with noodles, macaroni, and similar goods the results are often difficult to ob-

tain. Numerous fish eggs as caviar, carp, and red bream eggs and the yolk from the turtle give positive reactions with fowl egg yolk serum. The ovary of the turtle gave negative results.

A new instrument for measuring strength of alcoholic liquids (*Sci. Amer. Sup.*, 75 (1913), No. 1952, p. 342).—A description of Contassot's ebullioscope, which is intended for the rapid determination of alcohol in wine, beer, cider, etc. The operation requires from 5 to 6 minutes, and determines the boiling points of both the liquid and of pure water. "The usual method adopted for this purpose is to determine the boiling point of the liquid; this alone, however, is not enough, the boiling point of pure water must always be determined at the same time, since it depends on the barometric pressure."

An attempt to estimate the vitamin fraction in milk, C. FUNK (*Biochem. Jour.*, 7 (1913), No. 2, pp. 211-213).—The solids obtained from the evaporation of milk from London dairies in vacuo at 30° C. were dried at constant weight and shaken with alcohol for two hours. A portion of this alcoholic extract was evaporated to dryness and the residue extracted with water, and from the aqueous solution thus obtained the vitamin was precipitated with a 10 per cent solution of phosphotungstic acid.

The amount of beri-beri vitamin, as shown by this method, varied from 10 to 30 mg. per liter of fresh milk. "The figures show the milk after removal of fat by centrifuging has lost about 50 per cent of vitamin and allantoin."

"After the elimination of the vitamin fraction the residual nitrogen amounts to 20 to 50 mg. per liter of milk. This residual nitrogen represents in all probability allantoin. Assuming this to be correct, 1 liter of milk contains 0.06 to 0.15 gm. allantoin, a figure in good agreement with that obtained by Ackroyd by means of a direct method, namely 0.199 gm." It is also interesting to note that in allantoin we have a substance which, like vitamin, is destroyed by boiling.

The problems which have presented themselves in connection with this investigation, it is announced, will be more fully discussed in a later publication.

Aluminum hydroxid as a protein precipitating reagent in the determination of lactose in milk, W. H. WELKER and H. L. MARSH (*Jour. Amer. Chem. Soc.*, 35 (1913), No. 6, pp. 823, 824).—The results obtained with milks (human and cow's), clarified with aluminum cream and the copper sulphate-alkali method, show close agreement when examined for their lactose content. The lactose was determined by the copper reduction method with Fehling's solution, and the reduced copper was estimated by the cuprous iodid method as modified by Low.

Adulteration of milk.—Watering, C. PORCHER (*Indus. Lait*, [Paris], 33 (1913), Nos. 31, pp. 503-505; 32, pp. 511-518, fig. 1; 33, pp. 532-536; 34, pp. 547-550; 35, pp. 565-567; 36, pp. 577, 578).—This is a discussion and study in regard to the value of different methods for detecting adulterations in milk, including the cryoscopic or freezing test and the refractive index and specific gravity tests. The physiology of milk secretion is also considered, and it is shown wherein the natural watering of milk by an increased allowance of drinking water is unimportant.

A rapid method for determining the addition of water to buttermilk, H. M. HÖYBERG (*Ztschr. Fleisch u. Milchhyg.*, 23 (1912), No. 5, pp. 104-107).—In Denmark the addition of ice directly to buttermilk for cooling purposes is prohibited, consequently in controlling the milk supply the presence of an excess of water from this source must be considered. As nitrates are not always present in Danish waters, the test for nitrates can not be used. The determination of fat and fat-free dry substances can not be employed because the results vary too much. A better procedure seems to be to determine the specific gravity

of the whey of the buttermilk, and as a result of 112 determinations it was found that unadulterated buttermilk possesses a gravity varying from 1.025 to 1.0275. Accordingly, buttermilk having a gravity below 1.025 can be considered adulterated.

A rapid method of determining the solids in evaporated milk, O. F. HUNZIKER (*Indiana Sta. Rpt. 1913, p. 43*).—The formula given below was devised for the purpose of rapidly determining the total solids present in evaporated milk:

$$\left[\left(\frac{145.5}{145.5 - B} \right) \times 1,000 - 1,000 \right] \times \frac{1}{4} + 1.2 \times f$$

B represents the Baumé hydrometer reading at 60° F. and *f* the percentage of fat in the milk. The Baumé reading is not always conveniently determined at 60°, but tests showed that it may be correctly calculated from the observed reading at any temperature by adding to the observed reading 0.0313 points for every degree Fahrenheit over 60°.

Studies on flax retting, T. TADOKORO (*Jour. Col. Agr. Tohoku Imp. Univ., 5 (1913), No. 2, pp. 31-55*).—This investigation reports the results of a study of the changes in different stages of flax retting and the chemical nature of the constituents of the flax stem. The results of studies of the micro-organisms concerned with the retting process are reserved for future publication.

The flax used was typical in size, quality, and ripening, and was produced in the vicinity of Sapporo. The retting was done in a large crate according to the usual method in Hokkaido.

The author summarizes the results of his investigation as follows: "Cutin is the essential constituent of the cuticle, and tannin is found in the epidermal cell. The fiber consists of cellulose with a small quantity of pectin compounds, protein and fat-like substance as its integral part. On the other hand, the cell wall of the cambium, epidermis, and parenchyma are made up principally of pectin compounds with a small quantity of cellulose. The middle lamella of fibers is composed mainly of pectin compounds. Lignin forms the chief constituent of the cell wall of the xylem, while a pectin compound forms that of the pith.

"Water retting involves anatomical as well as chemical changes of the flax stem. On the first stage of retting, we observe the destruction of the cambium layer, and then of parenchyma, accompanied with the separation of fiber bundles. As the retting proceeds, the isolation of the fiber itself and the detachment of the cuticle take place. Nearly all of the constituents of the stems are subjected to chemical changes which are induced by the combined action of micro-organisms and of the extractive power of water. The loss of weight in the stem may therefore be taken as a measurement of the retting grade.

"The anatomical and chemical changes take place not on all parts of stem but only on the bark portion, i. e., the outer layers of cambium. The xylem and pith remain almost unchanged.

"The essential matters which are lost during retting are pentosan, or gummy substance, in the bark portion and fiber (cutin, lignin, and cellulose). Of the three ingredients composing pentosan-free fiber, the lignin remains almost unchanged, cellulose loses a small quantity, this being accompanied by the destruction of surrounding tissues of fiber bundles in the bark portion, and cutin is detached mechanically in the later stage of retting, with the destruction of other tissues.

"Among other ingredients, tannin is lost completely. The larger part of the mineral matters and of glucose are also lost. The quantity of protein and fat is very small and their loss may be neglected in consideration.

"The gummy substance, or pentosan, in the bark portion of the stem is made up largely of xylan and araban, with a small quantity of methyl pentosan."

Progress made in the manufacture of beet sugar in 1912, E. O. VON LIPP-MANN (*Chem. Ztg.*, 37 (1913), No. 19, pp. 193-195).—This deals with the progress made in the agricultural, technical, chemical, and other phases of this industry.

METEOROLOGY—WATER.

Reports on agricultural meteorology (*Inst. Internat. Agr. [Rome], Actes 4. Assemblée Gén., 1913, pp. 395-459*).—Reports presented at the Fourth General Assembly of the International Institute of Agriculture of Rome in May, 1913, by L. Dop of France, W. N. Shaw of England, Kuster of Germany, P. Rey of France, and P. Broounoff of Russia are given. These reports deal more particularly with the organization of agricultural weather services in the countries named.

Agricultural meteorology, M. YRANZO (*X. Cong. Internat. Agr. Gand, 1913, Sect. 2, Question 2, pp. 8*).—This article advocates particularly more complete systems of meteorological observations and a thorough distribution of forecasts. It proposes especially the establishment of a system of "régime types" of weather, the effects of which in a given region have been carefully worked out. It is thought that by the use of this system the transmission of weather forecasts can be greatly simplified and extended.

The method of forecasting proposed by Guilbert is approved, but its full application is not considered possible without a great extension of international observations reported to a central bureau.

A short list of more recent publications bearing on this subject is given.

Means of making weather forecasts more useful in the open country, E. VANDERLINDEN (*X. Cong. Internat. Agr. Gand, 1913, Sect. 2, Question 1, pp. 7*).—A general plea is made for the wider dissemination of popular information relating to meteorology so that farmers may have at least a sufficient scientific knowledge of the subject to interpret the weather maps. An increase in secondary stations so that the necessary information may be given out promptly locally is recommended, particularly for Belgium.

Report of the Iowa Weather and Crop Service for 1912, G. M. CHAPPEL (*Iowa Yearbook Agr., 13 (1912), pp. 1-48, fig. 1*).—This report summarizes data contained in the monthly and weekly bulletins issued by the Iowa Weather and Crop Service in cooperation with the Weather Bureau of this Department. The data were obtained from the 118 cooperative meteorological stations in the State and from the U. S. Weather Bureau stations at Des Moines, Davenport, Dubuque, Charles City, Keokuk, and Sioux City, Iowa, and Omaha, Nebr.

Division of meteorology, N. HELME (*Rhode Island Sta. Rpt. 1912, pp. 215-230*).—Daily observations at Kingston on temperature, precipitation, wind, and cloudiness for each month of the year ended June 30, 1912, are summarized in tables and notes. The mean annual temperature was 46.8° F.; the maximum 98°, July 10, 1911; the minimum -10°, February 11, 1912. The annual precipitation was 59.87 in., the number of clear days 150, and the prevailing direction of the wind west.

English climate and some of its variations, W. MARRIOTT (*X. Cong. Internat. Agr. Gand, 1913, Sect. 2, Question 2, pp. 5*).—Observations on temperature, rainfall, rain days, clouds and humidity, sunshine, and winds at all of the meteorological stations in England and Wales during the 30 years 1881-1910 are briefly summarized in this article to indicate the characteristic features of English climate and some of the more important variations to which it is subject.

Climate and meteorology of Australia (*Off. Yearbook Aust.*, 6 (1901-1912), pp. 67-102, figs. 8).—This is a summary in the usual form for the Australian Commonwealth up to the end of 1912.

The station of agricultural meteorology at Riudabella, J. P. GIL (*X. Cong. Internat. Agr. Gand*, 1913, Sect. 2, Question 2, pp. 9).—The character and purpose of the observations made at this station are briefly discussed, and observations on temperature, rainfall, sunshine, cloudiness, and wind movement during the years 1908-1912 are summarized.

The rains of the Nile Basin and the Nile flood of 1911, J. I. CRAIG (*Survey Dept. Egypt Paper* 27 (1913), pp. 110, pls. 9, figs. 2).—Observations similar to those of previous years (*E. S. R.*, 28, p. 315), are included in this report.

As regards the accuracy of discharge measurements and existing inconsistencies among the discharge results, the author is of the opinion that "some of these inconsistencies can doubtlessly be traced to . . . scour and silting of the channel, but these disturbances are not systematic, and in the long run or over a series of gages average out. . . . However, certain systematic causes are at work, and insufficient attention has hitherto been paid to turbulence, whose effect is always to give a discharge apparently too great. On this hypothesis, many inconsistencies, at present difficult of explanation, can be qualitatively explained, and when an adequate means of measuring turbulence is found, the quantitative explanation will follow."

Protection against hail by means of electric niagaras in Beaujolais, France, E. LASNIER (*Vie Agr. et Rurale*, 2 (1913), No. 49, pp. 585-588, figs. 2; *Deut. Landw. Presse*, 41 (1914), No. 3, p. 28).—The general conclusion drawn from a review of the experiments in Beaujolais during 1912 and 1913 is that the "electric niagaras" proposed by Beauchamp and Négrier were ineffective as a means of protection against hail.

"Gnamma holes" and "night wells," M. MACLAREN (*Geol. Mag.* [London], n. ser., V, 9 (1912), No. 7, pp. 301-304, figs. 2; *abs. in Geol. Zentbl.*, 19 (1913), No. 1, p. 21; *Wasser u. Abwasser*, 7 (1913), No. 9, p. 361).—The author describes the appearance and origin of these water supplies. The "gnamma holes" are said to be formed by the erosive action of wind and subsurface water, while the "night wells," in which water appears only at night, are caused by the arching of the gneiss sheets during the heat of the day, causing the water to recede and reappear only at night when the sheets have cooled and flattened.

The action of an alkaline natural water on lead, J. F. LIVERSEEGE and A. W. KNAPP (*Chem. News*, 108 (1913), No. 2811, p. 176; *abs. in Chem. Abs.*, 8 (1914), No. 2, p. 387).—Tests of a municipal water supply relative to its action on lead pipe and sheet lead showed an eroding but not a solvent action which is said to be due to the action of oxygen in the presence of water.

"As a rule a pipe becomes with age less sensitive to the action of the water but the rate of this change varies greatly with different pipes. Treatment of new pipes with a dilute solution of potassium permanganate gave them a considerable power of resistance to the action of the water. . . . The amount of lead eroded is affected by the distance from the lead to the water surface, is generally proportional to the area of the surface of the lead exposed, and does not depend on the volume of the water. . . . Four parts per 100,000 of calcium carbonate gave protection, and as little as two parts per 100,000 of calcium bicarbonate were sufficient practically to prevent erosion."

Water purification and sewage disposal, J. TILLMANS, trans. by H. S. TAYLOR (*New York*, 1913, pp. XV+143, figs. 21).—It is the purpose of this book to give a survey "as complete as possible of the present position in regard to water purification and sewage disposal" from the German point of view. "The careful attention which has been paid by the German authorities during the

past few decades to the provision of suitable water supplies and the adequate disposal of sewage, renders the present critical survey of modern methods . . . useful to the English reader."

The first half of the book is devoted chiefly to modern processes of purification of water for drinking purposes on both large and small scales. The purification of water for industrial purposes is also briefly touched. The second half discusses the mechanical and biological purification and disposal of domestic sewage, particularly noting the advantages and disadvantages of sewage farming and the use of screen and grit chamber residues and sludge as fertilizers.

The main purpose of the process of sewage farming is considered to be sewage purification rather than agricultural benefit, and "it is inadvisable on this account for towns to lease their sewage farms to farmers. . . . In all circumstances purification of the sewage before disposal on the farm is to be recommended." The residues from grit chambers and screens are said to contain some plant food elements and may be used as fertilizers though such use is usually offensive. Sludge from sedimentation tanks is said to contain (in dry matter) generally from 2 to 3 per cent nitrogen, about the same amount of phosphoric acid, and about 0.5 per cent potash, but owing to its foul condition and the difficulty and expense of drying, its use as a fertilizer is limited. The purification of industrial sewage is also discussed in some detail.

Scientific sewage and garbage disposal (*Daily Cons. and Trade Rpts.* [U. S.], 17 (1914), No. 29, pp. 449-459).—The methods of sewage and garbage disposal practiced in various places in the United Kingdom, Germany, France, Austria, and Russia are briefly described. It is shown that sewage irrigation and the utilization of sludge and certain garbage products as fertilizer is successfully practiced in many places in these countries, but generally, however, in connection with other methods of disposal.

Sewage sludge disposal (*Chem. Trade Jour.*, 54 (1914), No. 1391, pp. 71-73, figs. 3).—The Grossmann process of treating sludge to free it from fat and fit it for use as a fertilizer, as applied at Oldham, England, is described.

The Cairo sewage farm at Gebel el Asfar, E. C. B. SMITH (*Agr. Jour. Egypt*, 3 (1913), No. 1, pp. 23-27, pls. 4).—This article describes and illustrates by ground sections the geological features and formations of the sewage farm as determined by test borings which indicate its fitness for sewage irrigation.

SOILS—FERTILIZERS.

Agricultural chemistry—chemistry of the soil, G. ANDRÉ (*Chimie Agricole—Chimie du Sol. Paris, 1913, pp. XVI+556, figs. 9*).—This is one of the volumes of Wery's *Encyclopédie Agricole*. It is more than its title indicates, for it discusses the formation, classification, and physical and biological properties of soils as well as the more strictly chemical features of the subject.

The treatment of the subject is encyclopedic, and the book contains a large amount of information drawn from many sources which, however, are often not so clearly indicated by citation of references as the investigator could wish.

The historical development of certain phases of soil investigation is quite fully treated in some cases, but is not always brought up to date. This is notably true in the discussion of the chemistry of the organic matter of the soil in which no account is taken of the recent important work by American investigators.

Methods and aims of soil investigation and teaching, E. BLANCK (*Fühling's Landw. Ztg.*, 62 (1913), No. 13, pp. 462-473; abs. in *Zentbl. Agr. Chem.*,

42 (1913), No. 12, pp. 793, 794).—The author discusses various views on this subject and reaches the conclusion that it should be taught as an individual science from two standpoints, viz, the scientific and the technological.

Soil analysis, G. GOMEZ (*Bol. Dir. Gen. Agr. [Mexico], Rev. Agr.*, 2 (1912), No. 7, pp. 593-607).—The author points out the importance of physical and chemical analysis in soil classification and judgment, and in determining the fertilizer need of soils. He proposes a simple notation which facilitates comparison of the results of physical and chemical analysis.

Chemical composition of soils, V. I. VERNADSKIĖ (*Pochvov  d  nie (P  dologie)*, 15 (1913), No. 2-3, pp. 1-21).—The author, in the first part of his article, draws attention to the important part played by gases in the physical, chemical, and biological activity of soils, and also to their geological importance. He considers the colloidal soil constituents to be the seat of activity of soil gases, states that these gases or their solutions participate in all the processes of reduction, oxidation, and hydrate formation which occur in the soil, and reviews particularly the activities of nitrogen, hydrogen, oxygen, carbon dioxide, and methane in this respect. The character, properties, and quantitative relations in the soil of gases are said to be strongly influenced by meteorological and biochemical factors.

In conclusion the importance is emphasized of considering not only the solid and liquid soil constituents, but also the soil gases in soil analysis.

In the second part of the article attention is drawn to the elements rubidium, cesium, and thallium, and to their similarity to potassium. Cesium and thallium are disregarded as occurring only in traces, but the rubidium is thought to affect seriously the accuracy of potassium determinations in the ordinary methods of chemical soil analysis, owing to the significant quantities of the former element found in soils and plants and also to the difficulty of distinguishing it from potassium by the ordinary methods.

Colloidal chemistry and its importance in soils, geology, and mineralogy, H. NIKLAS (*Internat. Mitt. Bodenk.*, 3 (1913), No. 5, pp. 383-403, pl. 1).—The author reviews the elements of colloidal chemistry and points out some of its important relations to soils, geology, and mineralogy.

Most soil gels are considered to be reversible, and most soil colloids are considered to be negatively charged, which is said to explain their power for absorbing the positively charged bases of basic salts. Such absorption results in gel formation and better soil structure, as is shown by a series of photographs illustrating typical colloidal reactions, precipitation, and absorption. The absence of electrolytes, or the presence of so-called physiologically basic salts, such as sodium nitrate, is said to cause the formation of soils, which results in a compact, poorly aerated soil structure. In such cases fall plowing is suggested, as it allows the winter frost to form gels in the soil, thus loosening the structure. Heat and dryness are also said to coagulate the soil colloids and improve the structure, but too heavy rains form sols of the reversible gels and also by washing out the soil salts cause a return of the compact, badly aerated structure.

Soil formation by weathering is thought to be based on colloid chemistry, especially the formation of laterite, red soil, ortstein, and clay from feldspar. Colloidal humus is considered to be active in soil formation. The beneficial effect of lime salts on soil structure is attributed to the higher gel forming power of bases of higher valence, and it is stated that the more the effect of the positive ion exceeds that of the negative ion the more beneficial is the effect on the soil structure. The beneficial effect of stall and green manure on the soil structure is attributed to the addition of new colloids, which not only form gels but also dissolve lime.

The climatic soil zones and their characteristic soil formations, C. OHLY (*Internat. Mitt. Bodenk.*, 3 (1913), No. 5, pp. 411-455; *abs. in Rev. Sci. [Paris]*, 52 (1914), I, No. 12, pp. 374-376).—The author distinguishes the climatic zones of the desert, plain, savanna, forest, and tundra on the basis of the forms of vegetation found, and briefly describes their peculiar soil types.

He concludes that the climate is the principal factor in the formation and variation of soil. The more extreme the climate, the more uniform is the soil formation, and the less is the part played by their local condition. On the other hand, a variable climate, with a corresponding distribution of climatic factors, results in soil formations which are due to local conditions as well as climate. On this account the author concludes that the total vegetation forms of a region indicate the nature of the soil and climate, and that a consideration of these should be the basis of soil classification.

Review of climatic soil zones, K. VOGEL VON FALCKENSTEIN (*Ber. Oberhess. Gesell. Nat. u. Heilk. Giessen, Naturw. Abt.*, 5 (1912), pp. 156, 157).—A tabular representation of the processes of soil formation in arid and humid climates is given, which includes particularly podzol, chernozem, and semidesert soils. The difference in soil formation in arid and humid climates is shown to depend on the amount of rainfall, the possibility of evaporation, the difference in seasons, and local influences.

Land-climate and sea-climate high moors, H. STREMMER (*Pochovotvedenie (Pédologie)*, 15 (1913), No. 2-3, pp. 59-69).—A distinction is drawn between inland high moors and sea climate high moors, principally by a comparison of their prevailing types of vegetation. The prevailing type of vegetation of the high moors typical of sea climate is said to be the Sphagnum or peat moss, while the majority of the high moors typical of the land climate are said to be wooded with Ericaceae, and have in addition to Sphagnum many forms of vegetation which require a drier soil. Also the Sphagnum formation is covered with bunch grass, and some of these high moors are said to be even too dry for the Sphagnum to thrive.

Properties of the peat soils of Picardy, E. COQUIDÉ (*Ann. Sci. Agron.*, 4. ser., 2 (1913), II, No. 5, pp. 566-582; *abs. in Chem. Abs.*, 8 (1914), No. 6, p. 1179).—This article describes the peat soils of the region and their vegetation, and discusses their analysis as regards plant food and their dryness. The soils are said to consist of a black, very combustible peat, which is very compact, poorly aerated, of improper condition for nitrification, very poor in plant food, and either excessively humid or physiologically dry. The vegetation of the swamp peat soils is hygrophitic, while that of the dry peat lands is typically xerophitic.

The appearance of bleached soil and ortstein in the muck soils of the North Sea marshes, F. SCHUCHT (*Internat. Mitt. Bodenk.*, 3 (1913), No. 5, pp. 404-410).—The author found an apparently widespread formation of bleached soil (Bleicherde) and ortstein in the much weathered muck loam, muck clay, and muck sand soils of the North Sea marshes. The bleached soil contained some plant food, and the ortstein was wet and not hard enough to hinder vegetation.

Some factors of productiveness of soils poor in mineral plant food, K. VOGEL VON FALCKENSTEIN (*Ber. Oberhess. Gesell. Nat. u. Heilk. Giessen., Naturw. Abt.*, 5 (1912), pp. 139-151, fig. 1).—An investigation of forest soils in Germany shows the poor diluvial sands of northern Germany and the sterile colored sandstone soils of middle and southern Germany to contain sufficient mineral food for good forest growth. The diluvial sands are, ordinarily, of good depth, but in these and the sandstone soils a heavy covering of humus causes a formation

of the hard ortstein, which not only decreases the effective depth but also the food supply.

Three types of soil inclined to swamp formation were found in the colored sandstone regions: (1) White soils (Molkenböden), the weathering product of hard sandstone; (2) red clay, the weathering product of soft stone; and (3) red clay, underlying white soil. The white soils consist of a bleached out surface layer and an impervious substratum. Their characteristic property is a high content of dust and fine matter, and their main difference from the red clay is a lower total clay content but a higher silicate content. Drainage, forestation, mechanical cultivation, and liming are suggested for the improvement of white soils.

Polygon soils and "thufur" on Iceland, T. THORODDSEN (*Mitt. Justus Perthes' Geogr. Anst.*, 59 (1913), Nov., pp. 253-255).—The author reports the apparently widespread formation of the so-called polygon and "thufur" or hilly soils, which, he thinks stand in close genetic relation, in that variable evaporation, freezing, thawing, and the absence of drainage are essential conditions for the formation of both.

The polygon soils are said to occur only in flat soils of mixed clay and tufa, being divided into more or less regular polygons of wet clay, 1 to 1½ meters in diameter, which are separated by frost cracks filled with small stones, tufa, and refuse. Freezing is thought to force the coarse material down and laterally, while thawing, capillarity, and evaporation bring the fine material to the top.

The hilly or thufur soils are described as little knolls from ½ to 2 meters in diameter, and from ¼ to ½ meter high. The upper layer consists of humus and plant residue, and the interior of mixed soil and clay. These knolls are also separated by frost cracks and are thought to be formed in the same manner as the polygon soils, except that the rise of fine matter is more rapid.

Problems in the study of forest soils, G. A. R. BORGHESANI (*Gior. Geol. Prat.*, 11 (1913), No. 3-4, pp. 215-222, pl. 1).—The author emphasizes the importance in forest culture of choosing kinds of trees best adapted to the chemical properties of a particular soil, and of fertilization adapted to the kinds of trees chosen. Attention is further drawn to the effect of the litter covering on the conservation of forest soils.

The gases of swamp rice soils, W. H. HARRISON and P. A. SUBRAMANIA AIYER (*Mem. Dept. Agr. India, Chem. Ser.*, 3 (1913), No. 3, pp. 65-106, pls. 7, fig. 1; *abs. in Jour. Soc. Chem. Indus.*, 32 (1913), No. 24, p. 1165; *Nature* [London], 92 (1914), No. 2307, p. 564; *Chem. Abs.*, 8 (1914), No. 4, p. 772).—Investigations of the gases in swamp rice soils to determine their composition and relation to manuring and crop growth led to the following conclusions:

The normal fermentation of green manure in swamp paddy soils produces a relatively large proportion of methane, a smaller amount of nitrogen, and some carbon dioxide and hydrogen. The introduction of a crop so modifies the gas production as to reduce the proportions of methane and hydrogen and increase that of nitrogen. The restrictive action of crop growth on methane and hydrogen formation is due to retardation of fermentation or to absorption of a portion of the intermediate products of decomposition by the roots. The retardation of the normal evolution of nitrogen by crop growth indicates that there is an unknown surface evolution of nitrogen not connected with soil fermentation or the surface film which is affected by crop growth.

An anaerobic condition prevailed in the soil immediately after irrigation and throughout the irrigation period, making nitrification impossible and causing

the reduction of the nitrates present. It was concluded, therefore, that the nitrogen required by the crop was obtained from the ammonia and nitrogenous organic compounds produced by the anaerobic decomposition of the proteids of the green manure. Since certain substances so produced are toxic to the crop the application of green manure to poorly drained areas must be undertaken with caution.

Investigations of the gases evolved from the surface of rice soils led to the conclusion that the surface film of algæ, etc., which covers the surface of rice soils evolves a large amount of oxygen which is dissolved by the irrigation water, thus producing a highly aerated solution from which the roots in the soil derive their oxygen. "In undrained soils, this solution does not penetrate into the soil, and, consequently, the roots are congested near the surface of the soil and the amount of soil from which they derive their food is therefore limited and the crop suffers. In drained soils this strongly aerated water penetrates the soil and the roots are able to penetrate to a greater depth. The mass of soil from which the food supply is drawn is increased and the crop benefits in proportion." Too rapid drainage, however, decreases the formation of the surface film so that there is for all swamp paddy soils a comparatively slow optimum rate of drainage. Aeration by atmospheric oxygen is less effective than that by drainage water in promoting root aeration. The use of green manures in drained paddy soils induces a greater activity of the surface film, thus improving root aeration.

The organic constituents of soils (*Rev. Gén. Agron., n. ser., 8 (1913), Nos. 3, pp. 97-103; 4, pp. 145-154*).—This is an appreciative review of investigations by the Bureau of Soils of this Department.

Soil studies by the aid of their water solutions, R. BALLENEGGER (*Földtani Közlöny, 43 (1913), No. 7-9, pp. 359-366*).—Chemical studies are reported of the water solutions of a collection of typical Hungarian soils which were prepared by methods adopted by the Bureau of Soils of this Department (*E. S. R., 17, p. 831*). The soils studied were the gray and brown forest soils, the black clay, black, deep brown and alkaline plain soils, and the aluvial and sandy soils. Water solutions are said to be particularly adapted for the determination of the electrical conductivity.

Ultramicroscopy of soil extracts, S. M. MURAVLIANSKIĖ (*Pochvovîdîenie (Pédologie), 15 (1913), No. 2-3, pp. 23-27*).—Ultramicroscopic investigations of water and ammonia-alkaline extracts of chernozem soils having a variable humus content showed these extracts to be pseudo solutions. In both extracts the cone was more evident, and more submicrons and particles with diffraction rings appeared, the greater the humus content. The alkaline extracts showed a more pronounced cone and a greater number of submicrons than the water extract, while analytical data indicated that mineral constituents are prevalent in the water extracts and organic constituents in the alkaline extracts. It is therefore concluded that the soil colloids generally belong to organic matter.

Microflora of the Roman experimental field, R. PEROTTI (*Staz. Sper. Agr. Ital., 46 (1913), No. 10, pp. 661-668*).—The author discusses the microflora in the soils of this field relative to systems of cultivation, particularly noting the effect of the meteorological elements on their presence and activity and the importance of modifying systems of cultivation accordingly. It was found that the beneficial microbiological functions of this soil are retarded during the hot, dry summer months, while the maximum beneficial activity was found during the winter months, when there was more rainfall and the soil water content was higher.

A study of the formation of nitrates in various types of Virginia soil, E. B. FRED (*Centbl. Bakt. [etc.], 2. Abt., 39 (1913), No. 18-19, pp. 455-468*).—

These investigations have already been noted from another source (E. S. R., 29, p. 621).

Nitrification in acid or nonbasic soils, J. C. TEMPLE (*Georgia Sta. Bul. 103 (1914)*, pp. 15).—This is a fuller account of investigations briefly reported elsewhere (E. S. R., 26, p. 722).

The fertility of the soil, E. J. RUSSELL (*Cambridge, England, 1913*, pp. VI+128, pls. 10).—This is one of the Cambridge Manuals of Science and contains "the substance of talks, lectures, and other discourses delivered before all sorts and conditions of men and women and in all kinds of meeting places."

Different chapters treat of the natural history of the soil, how plant food is made in the soil, what soil fertility is and how it may be attained, soil fertility and systems of husbandry, the raising of the fertility limit, the checkered career of the clays, the rise of the sands, and the moor and its management. A brief concluding chapter sums up the general conclusions to which the preceding chapters lead. Here it is shown that while the main purpose of this book is to deal with the problem of making the soil fertile by modifying it to suit the needs of crops, the author is not unmindful of the great importance of modifying crops (by breeding) to suit the soil or of selecting crops especially suited to the soil and climatic conditions.

The increase of plant food in soils, C. T. GIMMINGHAM (*Chem. World, 2 (1913)*, No. 12, pp. 376, 377).—On the basis of previous investigations by Russell and Hutchinson (E. S. R., 29, p. 122), it is stated that without doubt the harmful factor which limits the number of plant-food producing soil bacteria, is living, and "the assumption that it is the active soil protozoa fits in with all the known facts."

Preliminary tank experiments on the movement, changes in composition, and toxic effect on wheat of certain salts in sandy loam and adobe soils, R. F. HARE ET AL. (*New Mexico Sta. Bul. 88 (1913)*, pp. 32, figs. 7).—The experiments reported were made in tanks filled with sandy loam and heavy adobe soils. Galvanized iron cylindrical tanks 8 ft. high and 8 in. in diameter with 15½ in. holes 6 in. apart from top to bottom were used. The cylinders were filled to within about 4 in. of the top with the soils mixed with varying proportions and combinations of sodium chlorid, sulphate, carbonate, and bicarbonate. The tanks were irrigated from time to time and samples of soil taken for examination at different depths through the holes in the sides of the tanks, the space left by the removal of the sample being filled with the original mixture of soil and salt and the holes kept tightly closed. Some of the tanks were left bare and others cropped to wheat.

The results are discussed in detail. They indicate in general "that the same treatment of sodium chlorid and sodium sulphate in adobe soil leached the chlorid to a crop tolerance limit of 32 in., while the sulphates were not carried beyond 2 in. On sandy loam the chlorids were leached to 80 in. and the sulphate to 38 in. In other words, nearly as much water was necessary to leach the sulphates from sandy loam as was required to remove the chlorids to the same depth in adobe.

"[Apparently sodium carbonate and bicarbonate] may move with the water by capillarity more than the other two salts. The possible change of either one of the salts into the other, as well as the neutralizing effect of gypsum in both soil and water, makes it difficult to compare the leaching action of water on these salts with those of sodium sulphate and sodium chlorid. At the end of the experiment the crop tolerance line of the carbonates and bicarbonates had apparently moved down 20 in. in the adobe soil and to 38 and 44 in., respectively, in the sandy loam.

"Only 0.2 per cent of sodium bicarbonate was added to the soil, and as this amount was fixed as the limit of crop tolerance, no leaching would be necessary to reach this point if it were not for the ready change of the 0.8 per cent of sodium carbonate to the bicarbonate form.

"The results of this experiment would seem to indicate that sodium carbonate and bicarbonate were more easily leached from sandy loam and clay soils than sodium sulphate, and almost equal to sodium chlorid, but the lowering of the tolerance limit of the carbonates and bicarbonates . . . was doubtless due more to reactions with other salts than to the leaching action of the water. This is indicated by the fact that carbonates and bicarbonates were never found concentrated at the lower limits of moisture as were the chlorids and sulphates."

Oat sick land, A. T. FOWLIE (*North of Scot. Col. Agr. Expt. Leaflet 28 (1913), pp. 97, 98*).—Attention is briefly called to certain lands on which oats refused to grow, and it is suggested that this condition is due to alkalinity resulting from the use of large amounts of seaweed. It was found that the application of ammonium sulphate in large measure corrected the unfavorable condition.

[**Unproductive peat or muck soils**], **A. T. WIANCKO** (*Indiana Sta. Rpt. 1913, pp. 60, 61*).—Certain unproductive peat soils which were well supplied with lime, but which did not respond to applications of potash and phosphates, were found to contain 4.375 parts per million of nitrates and total soluble salts amounting to 1.2 per cent. These soluble salts were largely concentrated in the surface soil and probably account for the unproductiveness of the soil and for the death of corn and onions when an attempt was made to grow these crops on the soil. Further proposed experiments with these soils are briefly referred to.

The reclamation of an unproductive soil of the Kankakee marsh region, J. B. ABBOTT, S. D. CONNER, and H. R. SMALLEY (*Indiana Sta. Bul. 170 (1913), pp. 329-374, figs. 22*).—In the experiments here reported it was found that certain restricted areas of peaty sand and dark sandy loam, aggregating perhaps 50 square miles in the Kankakee area in northwestern Indiana, were extremely unproductive even after thorough drainage and liberal manuring and fertilization.

Chemical analyses showed that the soils were fairly well supplied with plant food, but excessively acid; nevertheless the soils contained large amounts of nitrate nitrogen during the growing season. The nitric acid was found to be, in part at least, combined with aluminum, and the apparent acidity of water extracts of the soil was directly proportional to the amount of aluminum present in the solution. Evidently it represented the amount of alkali required to precipitate the aluminum rather than actual free acidity. Application of pulverized limestone rendered the soil productive but did not seem to accelerate greatly the already rapid rate of nitrification. "The evidence indicates that some element in these soils other than calcium or magnesium acts as a salifiable base capable of supporting nitrification, and the composition of the water extract of the untreated soil points strongly to aluminum."

It was found that very dilute solutions of aluminum nitrate were toxic to corn seedlings in water culture in the presence of mineral nutrients, the toxicity being approximately equal to that of nitric acid of the same normality and to that of cold water extracts of the unproductive soil containing the same amounts of aluminum and about the same amounts of mineral nutrients.

"The extreme toxicity of aluminum nitrate in water cultures, even in the presence of nutrients, together with the presence of large amounts of water soluble nitrate and aluminum in the soil, leads to the conclusion that soluble salts of aluminum, or more fundamentally, the lack of basicity which permits

them to exist, are largely responsible for the unproductiveness of the soil in question."

The toxicity is overcome and the soil rendered productive by adding compounds such as those of calcium, which possess the common property of precipitating the aluminum and at the same time forming nontoxic salts with its acid radical.

"Application of pulverized limestone or slaked lime at the rate of 2 to 4 tons per acre, supplemented by fertilization with phosphates and potash, has proved effective in field trials on a large scale and is recommended as a practical remedial treatment for rendering this type of soil productive."

The law of minimum, K. VON RÜMKE (Pühling's *Landw. Ztg.*, 62 (1913), No. 21, pp. 772-774).—The author maintains that the law of minimum applies not only to the external crop and culture relations but also to the racial performance of cultivated crops.

The influence of fertilizing on the resistance of grain to hail, GAUL (*Deut. Landw. Presse*, 40 (1913), No. 104, p. 1252).—Rye, unfertilized or fertilized with manure, showed a poorer stand and was less resistant to hail than that fertilized with superphosphates and kainit. Rye fertilized with nitrogen was strongly developed and showed great resistance, and in this respect ammonium sulphate appeared to give stronger and more resistant straw than sodium nitrate. Kainit also strengthened the straw and increased resistance.

A brief account of trials with lime fertilization, P. BOLIN (*Meddel. Centralanst. Försöksv. Jordbruksområdet*, No. 80 (1913), pp. 7; *K. Landtbr. Akad. Handl. och Tidskr.*, 52 (1913), No. 4, pp. 282-286).—In field trials during the season of 1911-12, lime was applied with sodium nitrate, Thomas slag and potash salt, farm manure, and farm manure with Thomas slag and potash salt, to green oats and hay.

The lime applied with artificial fertilizers did not produce any beneficial effect over that of artificial fertilizers alone, but increased the yields obtained in a marked manner when it was applied with farm manure, or with farm manure and artificial fertilizers. This was especially true in the case of the plats that had received lime (and manure) the preceding year. The favorable results obtained with lime and manure are attributed to the beneficial effect of the lime on the utilization of the nitrogen in the farm manure.

Lime-magnesia fertilizers, E. MABRE (*Prog. Agr. et Vit. (Ed. l'Est-Centre)*, 34 (1913), No. 47, pp. 657-664).—In field experiments on different soils the yields were generally profitably increased by the use of a fertilizer containing 43 per cent of lime and 30 per cent of magnesia, the results being especially favorable when the fertilizer was used in connection with Thomas slag.

Lime-magnesia ratio in the cultivation of grain, F. PISCIOTTA (*Staz. Sper. Agr. Ital.*, 46 (1913), No. 10, pp. 643-660).—Analyses of 60 Italian soils showed a wide variation in the lime-magnesia ratio, due principally to the variation in the lime. It was equal to 1 in only 1 soil and less than 1 in 4 soils. The addition of 40 lbs. of magnesium sulphate per acre to soils increased the grain yield, when added at the time of seeding, sufficiently to offset the expense of fertilization and yield a good net profit. When the magnesium salts were added in the spring, the profit was very small or negative. The best yield was obtained in soils with a high lime-magnesia ratio, but contrary to the theory of Loew a profitable increase was also obtained in soils having a lime-magnesia ratio less than unity.

Sponges as a fertilizer, J. G. SMITH (*Jour. Indus. and Engin. Chem.*, 5 (1913), No. 10, p. 850).—It is stated that sponges, which grow in enormous quantities in the shallow waters of southern Florida, are used with good results as a fertilizer.

Analysis shows approximately 4 per cent of nitrogen, 0.75 per cent each of potash and phosphoric acid, 5 per cent of lime and magnesia (mainly the former), and 40 per cent of organic matter in the air-dry loggerhead sponge, indicating a high fertilizing value.

Composts, R. D. ANSTEAD (*Planters' Chron.*, 8 (1913), No. 51, pp. 654-655).—About 24 tons of materials consisting of alternate layers of coffee pulp (E. S. R., 28, p. 224), ashes, and bone meal were placed in brick pits and allowed to rot down to about 15 tons of compost ready for application. This contained 68.8 per cent of water. The air-dry compost contained 4.34 per cent of phosphoric acid, 0.76 per cent potash, 5.89 per cent lime, and 1.96 per cent nitrogen.

Fertilizers in Japan, W. GASSETT (*Daily Cons. and Trade Rpts.* [U. S.], 17 (1914), No. 7, p. 109).—The total value of fertilizers consumed in Japan in 1912 is stated to have been \$104,425,093, of which \$30,617,500 was for artificial fertilizers, \$32,300,000 for night soil, \$31,410,000 for taibi (manure from straw, etc.), and \$7,057,500 for ryokubi (green manure (?)) and other kinds.

The value of imported manures was over \$26,000,000, including bean cake \$12,650,000, rape-seed cake \$1,300,000, cotton-seed cake \$500,000, ammonium sulphate \$7,500,000, phosphate \$3,150,000, and sodium nitrate \$1,400,000.

"Alaskan powdered fish manure has been imported for some years as a substitute for Hokkaido fish manure, but owing to the bad quality none was imported into Kobe in 1912. This year (1913) the quality has been improved, some shipments have been made, and there is a good demand for it at the present price, about \$2.15 per 10 kwan (about \$2.50 per 100 lbs.).

"The Japanese in Chosen recently have been using starfish as fertilizing material; it is reported to be excellent for rice. An analysis shows it to contain 4.858 per cent nitrogen and 0.889 per cent phosphoric acid. The price is about half that of Japanese-made oil cake."

Report of analyses of samples of commercial fertilizers collected by the Commissioner of Agriculture during 1913 (*New York State Sta. Bul.* 371 (1913), pp. 433-548).—Analyses of samples of fertilizers and agricultural lime collected and examined under the provisions of the New York State fertilizer law during 1913 are reported with a schedule of trade values of fertilizing materials and a brief discussion of the valuation and agricultural value of fertilizers.

AGRICULTURAL BOTANY.

Introduction to botany, J. Y. BERGEN and O. W. CALDWELL (*Boston, New York, Chicago, and London, 1914*, pp. VII+368, pl. 1, figs. 246).—This book, which is an abridgment of the authors' *Practical Botany* (E. S. R., 27, p. 423), is designed for half-year courses in elementary schools. The order of treatment adopted is to give a general notion of the distribution and importance of plants and to describe the plant as a working machine, discussing its structure and work, after which some of the greater groups are briefly presented. Throughout the entire work the plants used as a basis of study are usually those of common interest. A few of the more practical applications, such as timber and forestry, weeds, plant breeding, and the plant industries, are given separate chapters.

Popular botany: The living plant from seed to fruit, A. E. KNIGHT and E. STEP (*New York, [1913], vols. 1, pp. VIII+288, pls. 9, figs. 351; 2, pp. 289-588, pls. 9, figs. 370*).—This book tells in a popular manner of the salient features of plant life, the object being to awaken an interest in the plant world and to stimulate the reader to investigate facts for himself.

Plant life and plant uses, J. G. COULTER (*New York, Cincinnati, and Chicago, 1913*, pp. XVI+464, pl. 1, figs. 230).—This is an elementary text-book

designed as a foundation for the study of agriculture, domestic science, or college botany. It is intended to give the fundamentals regarding plant life in such a manner as to arouse an interest in plants and an appreciation of their rôle in organized life. The style is simple and direct, leading the young student gradually to the more complex problems, which are presented in a very simple manner. Exercises are appended to the various chapters, and by judicious selection the teacher should be able to give his pupils a fairly adequate knowledge of the principal facts regarding the plants of any locality.

The useful plants of the Dutch East Indies, K. HEYNE (*De Nuttige Planten van Nederlandsch-Indië*. Batavia: Dept. Landb., Nijv. en Handel, 1913, vol. 1, pp. 250+XXVII).—In this work the author describes the principal economic plants occurring in the Dutch East Indies and gives a synoptical catalogue of the collections in the technical museum at Buitenzorg. Detailed notes are given on the occurrence, distribution, parts used, methods of preparation, culture, commerce, etc. The present volume includes the genera and species of the families from Cycadaceæ to Orchidaceæ.

Northwest flora, T. C. FRYE and G. B. RIGG (*Seattle, Wash.* [1913], pp. 453).—This manual includes the flowering plants only and covers the States of Washington, Oregon, and Idaho, and the southwestern portion of British Columbia. Keys are presented, based as far as possible on easily determined characters, by which it is thought it will be possible for the student to recognize without difficulty the plants in the region included.

Attempts to grow mistletoe on monocotyledons and succulent conservatory plants, E. HEINRICHER (*Sitzber. K. Akad. Wiss. [Vienna], Math. Naturw. Kl.*, 121 (1912), I, No. 7, pp. 541-572, pl. 1, figs. 12).—This is a fuller account of studies noted previously from another source (*E. S. R.*, 29, p. 352).

Ripening and rest period of mistletoe seeds and conditions influencing germination, E. HEINRICHER (*Sitzber. K. Akad. Wiss. [Vienna], Math. Naturw. Kl.*, 121 (1912), I, No. 7, pp. 573-613, fig. 1).—Reporting a further study of the germination relations of *Viscum album* (see above), the author states that seeds of ripe mistletoe berries from plants cut early and hung in open shaded situations in October germinated readily in late fall and winter, but not in spring, while those of live plants preserved their germinability all winter. Indoor culture shortened both the rest period and germinating period of the seeds, preserving their full germinability. Toward the red end of the spectrum both germinability and subsequent growth were favored, while toward the violet end many seeds were killed before germination. Moisture and temperature seemed to affect germination by influencing the activity of bacteria and fungi present in the slime secretion which secures adhesion of the seeds to the host plant.

The rôle of acids in germination, GERMAINE PROMSY (*Du Rôle des Acides dans la Germination*. Thesis, Univ. Paris, 1912, pp. 177, pl. 1, figs. 11).—The author presents a detailed account of her investigations on the rôle of acids in the germination of seeds, some of the results of the investigation having been noted elsewhere (*E. S. R.*, 27, p. 729; 29, p. 26).

The author has found, from her study of a large number of seeds, that germination is favored by weak acidity in the medium, especially of those seeds which are from fleshy acid fruits. An investigation of these fruits during their decomposition showed that their acidity did not exceed the degree found most favorable to the germination of their seeds. The organic acids favor an increased dry weight in seedlings more than the mineral acids. Salts of the stronger acids induced turgescence, but did not increase dry weight.

The medium in which the seedlings were grown was found to bear an important rôle in the experiments. Knop's solution always showed an antag-

onistic action toward the acids. It is thought that the action of the acids could be explained by the possibility that they transform zymogens in the seed into active ferments and at the same time attack some of the reserve materials in the seed, such as the starch.

The principal modifications in the anatomy of the seedlings due to the acids are said to be a retardation in the thickening of the supporting tissues, greater size of the central cylinder, and an increase in the conducting tissues.

The influence of light on seed germination and its dependence upon other factors, H. BAAR (*Sitzber. K. Akad. Wiss. [Vienna], Math. Naturw. Kl.*, 121 (1912), I, No. 7, pp. 667-705, figs. 4).—The author reports that germination of seeds of *Amarantus* was hindered by light, a tender age of the seeds generally increasing their sensitivity. The maximum limitation was noted at temperatures between 10 and 5° C. *Physalis franchetti*, which germinated better in light than in darkness at 35 to 15°, gives a better response to darkness than to light at 15 to 5°. The substratum is said to be of more importance in this connection in case of the lower temperature. Germination of fresh seeds of *Clematis vitalba* at low temperatures is favored by darkness, that of older seeds by light. Seeds of *Begonia semperflorens* germinated better in light.

A bibliography is appended.

A first study of the relationship between the weight of the bean seed, *Phaseolus vulgaris*, and the time required for its germination, J. A. HARRIS (*Plant World*, 16 (1913), No. 10, pp. 267-274, figs. 2).—From the data obtained in a series of experiments with *P. vulgaris*, the author finds that as the weight of the seed increases the time required for germination becomes longer.

Alcohol formation by sprouting wheat, S. KOSTYTSCEW and A. SCHELOUMOFF (*Ber. Deut. Bot. Gesell.*, 31 (1913), No. 8, pp. 422-431).—The authors state, in regard to living wheat sprouts, that they form with complete aeration no alcohol. In the presence of toluol, the formation of alcohol is only 3 per cent of carbon dioxid, but with incomplete aeration, 50 per cent as much as that of carbon dioxid. With living embryos all of the carbon dioxid formed is thought to be referable to normal respiration, with those not capable of growth only half.

The respiration of living and of killed wheat seedlings, S. KOSTYTSCEW, W. BRILLIANT, and A. SCHELOUMOFF (*Ber. Deut. Bot. Gesell.*, 31 (1913), No. 8, pp. 432-441).—It is stated that an apparently slight limitation of the air decreased considerably the amount of oxygen taken up into both living and dead roots of wheat. While certain phosphates exert no perceptible influence upon the production of carbon dioxid and the absorption of oxygen by living wheat embryos, fermented sugar solutions increased both proportionately in the case of living plantlets. Dead plants showed an increase of carbon dioxid only.

The influence of location on leaf development of *Ipomœa pes-capræ*, Z. KAMERLING (*Rec. Trav. Bot. Néerland.*, 10 (1913), No. 2, pp. 147-152, figs. 2).—Comparative measurements of leaves of *I. pes-capræ* grown on open coasts with those grown in partial shade are cited to show that while development in the apical portions (which is completed relatively early) is much the same in both situations, development of other portions of the leafblade and of the petiole is very much greater in case of partially shaded plants.

Is there a mutual stimulation of plants through root influence? T. L. LYON and J. A. BIZZELL (*Jour. Amer. Soc. Agron.*, 5 (1913), No. 1, pp. 38-44).—Experiments in growing different plants on the same area at the same time are held to show that a number of common agricultural plants named, such as wheat and mustard, timothy and red clover, barley and buckwheat, and peas and lettuce, are advantageous to each other when grown on the same ground.

Secretion by roots of substances toxic to the plants, M. MOLLIARD (*Bul. Soc. Bot. France*, 60 (1913), No. 5, pp. 442-446).—Comparison of the develop-

ment attained by peas furnished with distilled water with that attained by those furnished with aerated water is said to support the hypothesis that substances are formed by growing roots which are toxic to plants of the same species.

The root nodules of the Podocarpeæ, W. B. BOTTOMLEY (*Abs. in Rpt. Brit. Assoc. Adv. Sci., 1912, p. 679*).—Discussing the functions of the root nodules of the several genera in connection with their structure as described by Miss Ethel R. Spratt (*E. S. R., 27, p. 828*), the author states that the bacterial tissue of the nodule continues functional as such for one year only, being pushed out in the following spring to form in connection with older layers an outer protective zone, the outermost layer of which remains intact except in case of the bifurcated nodules of *Saxegothæa*.

The function of calcium in plants, K. FAACK (*Mitt. Landw. Lehrkanz. K. K. Hochsch. Bodenkul. Wien, 2 (1913), No. 1, pp. 175-207*).—Presenting the results of a study on the influence of calcium and related elements separately and together on plants, the author states that the injurious effects of a calcium-free medium are due to its extraction of calcium from the plant organs, which by inner supply with calcium may be protected from such injury; that high concentrations of strontium without calcium influence plant growth unfavorably; that by supplying sufficient calcium with strontium the injurious effects of the latter are lessened or prevented; that while strontium in part takes the place of calcium, permitting limited development, its influence is partial and temporary, only deferring the exhaustion of the plant; and that strontium does not appear to influence the distribution of carbohydrates or the localization of that process. A bibliography is appended.

The inutility of zinc in the culture of *Aspergillus niger*, C. LEPIERRE (*Compt. Rend. Acad. Sci. [Paris], 157 (1913), No. 19, pp. 876-879*).—In continuance of previous reports (*E. S. R., 29, p. 628*), the author states that while under certain conditions zinc exerts a favorable influence on growth of *A. niger*, its presence is not indispensable to the complete development of this fungus. Apparent exceptions are probably due to a lack of purity in the materials employed.

Inutility of zinc for culture of *Aspergillus niger*, C. LEPIERRE (*Bul. Soc. Chim. France, 4. ser., 13 (1913), No. 24, pp. 1107-1121*).—Continuing the above discussion of his own work, in connection with the results and views of others, the author holds that the undeniable utility of zinc in certain concentrations for the culture of *A. niger* is not to be confounded with the indispensability thereof, as held by some authors mentioned.

Zinc and *Sterigmatocystis nigra*, H. COUPIN (*Compt. Rend. Acad. Sci. [Paris], 157 (1913), No. 25, pp. 1475, 1476*).—Noting recent observations of his own in connection with the reports and views of Lepierre (see above), considered by Javillier to be inconsistent with the results of his own experiments (*E. S. R., 20, pp. 28, 831*), the author concludes that the results of his own work and that of the former author are reciprocally confirmatory.

Zinc and *Aspergillus*, C. LEPIERRE (*Compt. Rend. Acad. Sci. [Paris], 158 (1914), No. 1, pp. 67-70; abs. in Rev. Sci. [Paris], 52 (1914), I, No. 3, p. 94*).—Repeating the experiments of Coupin and Javillier (above noted) under the original conditions, so far as possible, the author concludes that the differences noted, which were apparent also in his experiments, may be due to differences in conditions of aeration, etc.

Osmotic pressures in plant organs.—III, The osmotic pressure and electrical conductivity of yeast, beer, and wort, H. H. DIXON and W. R. G.

ATKINS (*Sci. Proc. Roy. Dublin Soc., n. ser., 14* (1913), No. 2, pp. 9-12; *Notes Bot. School Trinity Col. Dublin, 2* (1913), No. 4, pp. 173-176).—In continuance of studies previously reported (E. S. R., 29, p. 828), the authors found that in both osmotic pressure and electrical conductivity pressed yeast gives values much higher than those of wort. Bakers' yeast, however, gave a low osmotic pressure but a high conductivity even after washing. On comparing the results given by beer with those of wort, it was noted that while the electrical conductivity remains much the same, the osmotic pressure becomes approximately three times as great during fermentation, when interrupted at the usual stage in the commercial process. Very complete fermentation, however, in the single experiment carried out, occasioned a fall in osmotic pressure after the initial rise and was accompanied by a marked increase in conductivity.

Studies on the influence of electricity on plant growth, W. SCHIKORBA (*Mitt. Kaiser Wilhelms Inst. Landw. Bromberg, 5* (1913), No. 5, pp. 403-411, fig. 1).—Tests with an electrical brush discharge of high tension on the development of several cereals are reported to show no very decidedly beneficial effects on growth. The results reported by P. Vozáry (E. S. R., 28, p. 326) are thought to be due largely to an increase of transpiration by the electrical wind attending the brush discharge.

Influence of radio-active emanations on vegetation, J. STOKLASA and V. ZDOBNICKY (*Compt. Rend. Acad. Sci. [Paris], 157* (1913), No. 22, pp. 1082-1084).—Presenting some quantitative results of a study with several grains, legumes, etc., subjected to radio-active energy from different sources, the authors state, in conclusion, that radio-active emanations in moderate concentrations influence favorably the development of plants and gaseous exchange thereby, their flowering, and total production. Very heavy concentrations, on the contrary, check the development and appear to cause or favor the formation of toxic substances in the chlorophyll bearing portions.

Influence of radio-activity on micro-organisms which fix nitrogen or transform nitrogen compounds, J. STOKLASA (*Compt. Rend. Acad. Sci. [Paris], 157* (1913), No. 19, pp. 879-882).—This is a study of several nitrifying and denitrifying bacteria in varied nutritive solutions subjected to the action of emanations from pitchblende. The results are thought to show a considerable influence of radio-activity upon the general circulation of nitrogen and to be of importance in connection with the control of soil fertility.

The study of cold resistance by cereals, G. GASSNER and C. GRIMME (*Ber. Deut. Bot. Gesell., 31* (1913), No. 8, pp. 507-516).—In tests with barley and rye it was found that the varieties germinating at the lower temperatures showed the higher sugar content, but no other marked differences of composition. Winter injury to green plants is attributed to volumetric alterations rather than to any peculiar effect on the plant cells.

The blackening of the leaves of *Aucuba japonica*, S. G. PAINE (*Abs. in Rpt. Brit. Assoc. Adv. Sci., 1912*), pp. 439, 440).—Experimental evidence cited is claimed to show that not only anesthetics but a variety of other agencies produce the blackening of leaves studied in *A. japonica*. It is stated that the only character common to these agencies is not that they are activators of enzymes but that they tend to produce death of the tissues. The blackening is held to be a result of changes of permeability whereby enzymes more readily pass into the tissues, as claimed by Maquenne and Demoussy (E. S. R., 23, p. 131).

Studies on photosynthesis, K. PURIEWITSCH (*Jahrb. Wiss. Bot. [Pringsheim], 53* (1913), No. 2, pp. 210-254, figs. 18).—The utilization rate of the leaves (so far as tested) for incident solar energy as related to photosynthesis was found to vary from 0.6 to 7.7 per cent. The average rate shown by *Acer platanoides* was 1.3 per cent and that by *Polygonum sachalinense* 3.6 per cent.

FIELD CROPS.

Cultivation of crops, M. HOFFMANN and A. KOSTLAN (*Jahresber. Landw.*, 26 (1911), pp. 105-216).—Recent German publications of investigations on this subject are classified and reviewed.

Addresses on plant breeding (*Beitr. Pflanzenzucht*, No. 3 (1913), pp. VIII+216, figs. 45).—This publication gives the proceedings of the third annual meeting of the Society for the Promotion of Plant Breeding in Germany, and the following addresses with discussions: Rye Breeding, by K. von Rümker; Some Practical Results in Recent Hybridization Work, by E. Baur; Unusual Cereal Hybrids, by E. von Tschermak; Winter Wheat Work at Svalöf Farm, 1900-1912, by H. Nilsson-Ehle; The Production of Elementary Varieties from Hybridization with Mendelian Segregation, by F. Rosen; The Technique of Grass Breeding, by Fruwirth; The History of Germination with the Sugar Beet, by R. Schander; The Application of Probable Error Formulas in Plant Breeding Manipulations, by H. Quante; and Sex-limited Inheritance in the Animal Kingdom, by F. Pax.

The storage of vegetable products of agriculture, A. GRÉGOIRE (*Rev. Écon. Internat.*, 10 (1913), II, No. 2, pp. 444-459).—This article surveys the work done in this field on hay, silage, and grain, and discusses the resulting chemical, bacterial, and other changes that take place and the effect on the value of the product.

[Experiments with field crops], F. WATTS ET AL. (*Imp. Dept. Agr. West Indies Rpts. Bot. Sta. [etc.] Antigua, 1911-12*, pp. 6-21).—In continuation of work previously noted (E. S. R., 26, p. 733), this reports the results of experiments in progress with sweet potatoes, broom corn, cotton, yams, sesame, green manures, Jerusalem peas (*Phaseolus trinervis*), pigeon peas, cowpeas, Dwarf Essex rape, castor beans, onions, peanuts, and soy beans. A report is given of special work which is being carried on in the selection and hybridization of cotton.

Report on the botanic station, St. Kitts-Nevis, 1911-12, F. WATTS (*Imp. Dept. Agr. West Indies, Rpt. Bot. Sta. St. Kitts-Nevis, 1911-12*, pp. 34).—In continuation of earlier work (E. S. R., 26, p. 534), this report gives the results of experiments in hybridizing cotton, and varietal and manurial trials with sweet potatoes, yams, tobacco, cassava, peanuts, pineapples, Guinea corn, onions, Indian corn, and sugar cane.

Annual report of the demonstration farm, St. Andrew's Colonial Homes, Kalimpong, for the year 1911-12 (*Ann. Rpt. Kalimpong Demon. Farm [India] 1911-12*, pp. II+25).—This report gives notes on trials of varieties of maize, rice, millet, buckwheat, wheat, barley, cotton, and legumes.

Annual report of the Rajshahi Agricultural Station for the year 1911-12 (*Ann. Rpt. Rajshahi Agr. Sta. [India], 1911-12*, pp. 7).—This reports experimental work with winter rice, jute, and sugar cane. In spacing winter rice it was found that 2 or 3 plants per hill, and the hills 8 in. apart in the row, gave better results than 1 or 4 plants per hill or hills spaced 10 or 12 in. apart.

Annual report of the Rangpur Farm for the year 1911-12 (*Ann. Rpt. Rangpur Farm [Bengal], 1911-12*, pp. 10).—This report gives brief notes on variety tests of millet, potatoes, sugar cane, jute, and rice.

Fodder plants of Java, I and II, C. A. BACKER (*Teysmannia* 23 (1912), No. 2, pp. 102-112, pl. 1; 24 (1913), No. 4, pp. 209-229).—This article treats of the history and botanical description of *Sesbania grandiflora*, *Artocarpus integrifolia*, and the various species of *Paspalum*, discusses their cultivation and value, and gives chemical analyses, coefficients of digestibility, and yields.

Native permanent meadow v. seeded meadow, SCHUBERT (*Wiener Landw. Ztg.*, 63 (1913), No. 18, pp. 211-213, figs. 12).—In experiments conducted during 1911 and 1912 the superiority of the seeded areas showed in the marked improvement in the quality of the hay and also in the yields, which increased from 83 to 175 quintals per hectare (3.7 to 7.8 tons per acre) in 3 cuttings in 1912.

On the manuring of meadow hay, J. PORTER (*Herefordshire County Council Sub. Farmer's Bul.* 5 (1910), pp. 6).—The use of sulphate of ammonia alone apparently favored the growth of the grasses, while phosphate and potash favored the growth of legumes and depressed that of the grasses. Lime was followed by a net increase in hay yields. The omission of phosphates resulted in a greater loss in yields than the omission of either nitrogen or kainit. "The most successful dressing used in the experiment was a medium dressing of farmyard manure (10 tons) in alternate years, and during those years receiving no farmyard manure a mixture of 102 lbs. sulphate of ammonia and 352 lbs. superphosphate." The 5-year average of hay yields per acre ranged from 27 cwt. without fertilizers to 37.5 cwt. with a complete fertilizer which consisted of 102 lbs. sulphate of ammonia, 60 lbs. sulphate of potash, and 352 lbs. superphosphate per acre.

Trials in seeding cereals in hills, J. DUMONT (*Ann. École Nat. Agr. Grignon*, 2 (1911), pp. 59-62).—Harrowing and rolling were followed by larger yields with wheat than rolling alone, whether the seed was drilled with 18 cm. (about 7 in.) between drills, or planted in hills 10 by 25 cm., 1 kernel per hill, or in hills 20 by 25 cm. with 2 kernels per hill. In another similar group of plats hoed and weeded the yields were still further increased. The wheat planted 10 by 25 cm. with 1 kernel per hill gave the best results in each case.

A study on causes of the difference in drought resistance between clover and alfalfa, W. SHOLTKEWITSCH (*Zhur. Opytn. Agron. (Russ. Jour. Expt. Landw.)*, 14 (1913), No. 3, pp. 167-180, figs. 4).—In a study of the movement of water in these plants, the relation of transpiration between clover and alfalfa stood as 100:163 and the length of the stomata as 100:156. The pith occupied relatively less of the cross section of the stem in alfalfa than in clover, but the number of xylem bundles was proportionately increased. The diameters of these vessels were also larger than those of clover and allowed from 4 to 4.5 times as much water to pass through them.

Agave in the West Indies, W. TRELEASE (*Mem. Nat. Acad. Sci.*, 11 (1913), pp. 299, figs. 227).—The author gives in tabular form an analysis of the geographical distribution of agave in the West Indies, and discusses the specific characters of the trunk, leaves, flowers, fruit, and bulbils. A synopsis is followed by botanical descriptions of 8 groups including 56 species.

Three-year results with Turkestan alfalfa, J. GYÁRFÁS (*Kísérlet. Közlem.*, 16 (1913), No. 3, pp. 405-408).—These results showed Turkestan alfalfa to be inferior to Hungarian alfalfa at the Magyar Ovar station.

Experiments with a new form of barley, E. SCHNEIDER (*Ztschr. Pflanzenzücht.*, 1 (1913), No. 3, pp. 301-322, figs. 3).—This describes a new form of barley that appeared in Posen in 1902, the chief feature of which was a branching of the spikes. This characteristic proved to be transmitted with constancy. The yield was somewhat in excess of the ordinary varieties, but the quality was inferior.

Thermotoxy, or factors in the growth of cotton in Egypt, W. L. BALLS (*Rpt. Brit. Assoc. Adv. Sci.*, 1912, p. 682).—The author here notes the complete arrest of growth in the bud of Egyptian cotton when the day temperature reaches 35° C. (95° F.) for successive days, due, probably, to toxins being more rapidly secreted than dissolved, on account of a suspension of growth processes.

Different species of *Gossypium* differ greatly in their liability to this poison under the same conditions without any relation to their temperature acceleration of growth. Hybrids therefore showed most various growth relationships in F_2 and there were indications that a Mendelian segregation may be found.

The culture of cotton in Egypt, AHMED EL ALFI, trans. by A. SEBBAGH and C. LÉPINEY (*Dir. Gen. Agr., Com. et Colon. [Tunis], Mem. et Docs., No. 6 (1913), pp. II+134, figs. 2*).—The 3 parts of this book treat of the cultivation and seed production, diseases, and insect enemies of cotton, and general observations on the industry in Egypt, and also include statistical data.

The relation of cotton buying to cotton growing, O. F. COOK (*U. S. Dept. Agr. Bul. 60 (1914), pp. 21*).—This bulletin contains discussions and suggestions under the following headings: The need of discrimination in buying; varieties deteriorate by losing uniformity; careful farmers deserve the higher prices; discrimination in buying more important than high prices; development of new long-staple districts; commercial causes of deterioration of cotton; deterioration of the Sea Island cotton crop; limitations and injustice of the present system of buying; uniformity best determined by field inspection; field inspection in the interest of manufacturers; other causes of uneven fiber; and economic peculiarities of the cotton industry.

Tests of the waste, tensile strength, and bleaching qualities of the different grades of cotton as standardized by the United States Government, N. A. COBB (*U. S. Dept. Agr. Bul. 62 (1914), pp. 8, fig. 1*).—This is a report of progress upon some spinning tests that are being made at about a dozen cotton mills in the United States to determine qualities of cotton fiber that may be used in fixing market grades.

Some results obtained thus far show the average difference in percentage of visible waste between "Western upland" and "Atlantic States upland" to be between 1 and 2 per cent. Preliminary tests show the yarn from the two classes of cotton to be about equal in strength. The mill waste in the experiments to date varied from about 4 per cent in "middling fair" to about 11 per cent in "good ordinary" cotton.

Elephant grass, O. STAFF (*Roy. Bot. Gard. Kew, Bul. Misc. Inform., No. 7 (1912), pp. 309-316; Rhodesia Agr. Jour., 10 (1913), No. 3, pp. 362-368, pls. 3*).—This article gives the history, distribution, vernacular names, uses, and chemical analysis of *Pennisetum purpureum*. It is noted that the analysis indicates a feeding value similar to maize fodder, and a rather high fertilizing value. The plant is a better drought resister and gives larger yields than Paspalum.

Comparison of phonolite meal (potassium silicate) with forty per cent potassium salt in fertilizing hops, F. WAGNER (*Prakt. Bl. Pflanzenbau u. Schutz, n. ser., 11 (1913), Nos. 4, pp. 52, 53; 5, pp. 67-70; 6, pp. 77-82, fig. 1*).—The use of 143 kg. of K_2O in the form of 40 per cent salt was followed by an increase in yield of hops per hectare over untreated plats of 763 kg., whereas the same amount of K_2O as silicate (phonolite) showed a gain of 245 kg. Using half the quantities of K_2O , the respective gains were 466 and 92 kg. The largest yield gave the largest net profit per hectare.

Origin and home of the cultivated oats, A. SCHULZ (*Ztschr. Gesam. Getreidew., 5 (1913), No. 5, pp. 139-142*).—In this article the author divides the species into 7 subspecies and discusses the appearance of these in various countries in which they seem native.

Report on oat culture experiments in Saxony, 1910-1912, STEGLICH (*Sächs. Landw. Ztschr., 61 (1913), Nos. 11, pp. 144-148; 12, pp. 161, 162*).—This reports the results of varietal and cultural tests of oats in progress, with special reference to the influence of change of soil and climatic conditions on yields.

The oat kernel, R. A. BERRY (*Rpt. Brit. Assoc. Adv. Sci.*, 1912, pp. 733, 734).—The results from a series of analyses extending over several years are reported.

"By tabulating the grain of over a hundred varieties, according to the percentage and weight of kernel, along with the chemical analyses, it is possible to distinguish several more or less well-defined types. The white grains group into (1) small grains with a thin husk, a high percentage of oil, and an average percentage of nitrogen. These are characteristic of and include the old Scotch varieties with the newer selected strains from same. (2) Large grains fall into 2 groups, viz, a thick husk, a low percentage of oil, and high nitrogen; a thin husk, a higher percentage of oil, and a lower nitrogen. (3) Grains intermediate in character and chemical composition to the large and small include the bulk of the newer hybrid varieties.

"The black grains grade into (1) small grains with a thick husk, low oil, and average nitrogen; (2) medium grains with a thick husk, high oil, and low nitrogen; (3) large grains with a thin husk and the richest kernel of the cultivated oats. These are the winter oats. The reddish and yellow grains form separate groups. The wild oat surpasses all in richness of kernel.

"[Regarding the variation of the kernel,] results show that climate is the most disturbing factor. Distinguishing characters associated with a certain set of climatic conditions become greatly modified and, in some cases, almost obliterated when the conditions are radically changed. . . .

"Micro-chemical tests [with oil and nitrogen] show the oil to be located in the aleurone layer and the embryo. The latter forms from 2.5 to 4 per cent of the kernel, and contains between 11.25 and 12.25 per cent of the oil, and between 4.5 and 6.5 per cent of the protein of the whole kernel. The smaller grains of the same variety are invariably richer in oil but slightly poorer in nitrogen. Analyses made every 3 days during the formation and maturation of the grain show the oil to increase rapidly in the first half, then remain stationary, while the nitrogen increases all through the period."

Irish potatoes in Florida, A. P. SPENCER (*Florida Sta. Bul.* 120 (1914), pp. 83-93, figs. 4).—Cultural methods are given, with special reference to the Spaulding Rose 4 variety on flat-woods land.

Potato culture, A. W. GARDENER (*Cuba Mag.*, 4 (1913), No. 11, pp. 508-511, fig. 1).—This article gives a practical method of producing potatoes in the Isle of Pines, in which the total cost was \$91.20, with a net profit of \$131 per acre.

On the manuring of potatoes, J. PORTER (*Herefordshire County Council Farmer's Bul.* 2 (1910), pp. 4).—These experiments indicated that the omission of potash from an otherwise complete fertilizer is not advisable, as the yields were reduced 26 cwt. per acre. The results were better with sulphate of potash than with the low grade potash manures, and with nitrate of lime than with sulphate of ammonia. The yields ranged from 6 tons 15 cwt. to 10 tons 7½ cwt. per acre.

Experiments in the pollination of rape, K. VON RÜMKE and R. LEIDNER (*Ztschr. Pflanzenzücht.*, 1 (1913), No. 3, pp. 323-327, fig. 1).—From field observations in breeding rape and developing seeds from flower buds isolated in glass tubes, the author concludes that rape is self-fertilizing as a rule but that it may be fertilized by foreign pollen.

Cultural experiments with annual rye grass, AHR (*Prakt. Bl. Pflanzenbau u. Schutz*, n. ser., 10 (1912), No. 10, pp. 113-118).—When Italian rye grass was sown in red clover, the yield of hay was increased only 13.7 kg. per hectare (12.2 lbs. per acre) in 1 case and 350 kg. in another, while with annual rye grass the amount of hay increased 970 and 230 kg. When annual rye grass was seeded alone at the rate of 30, 40, 50, and 60 kg. of seed per hectare, the

yields of hay were 7,480, 7,840, 8,800, and 8,300 kg. per hectare, respectively. These yields were obtained in 3 cuttings.

Comparison in field experiments with **Westerwold, Argentina, and Italian rye grass**, HILTNER, LANG and GENTNER (*Prakt. Bl. Pflanzenbau u. Schutz, n. ser.*, 10 (1912), No. 10, pp. 118-124, fig. 1).—The yields in these experiments were with Westerwold 109.5 kg., Argentina 119 kg., and Italian rye grass 128.5 kg. per plat, produced in 2 cuttings each.

The **Sansevierias**, F. MICHOTTE (*Agr. Prat. Pays Chauds*, 13 (1913), Nos. 122, pp. 356-375; 123, pp. 455-474, figs. 2).—This paper describes the botanical characteristics of this genus of plants, methods of cultivation and propagation, and the climate and soil to which it is adapted, and mentions the countries in which it appears. Methods of extracting the fiber by hand and by machinery are described, and the chemical composition, fiber strength, and uses of the fiber are given.

Bud mutations of tubers as affected by cultural methods with *Solanum tuberosum* and *S. maglia*, E. HECKEL (*Bul. Soc. Nat. Agr. France*, 72 (1912), No. 8, pp. 698-716, pl. 1, figs. 3).—This article gives the results of observations on the manner of variations of *S. tuberosum* and *S. maglia* as influenced by cultural methods, especially by the applications of cow, horse, sheep, and hen manure in varying mixtures.

Sugar-beet growing under irrigation, C. O. TOWNSEND (*U. S. Dept. Agr. Farmers' Bul.* 567 (1914), pp. 26, figs. 5).—This gives directions for sugar-beet culture under irrigation and discusses, with suggestions, the subjects of selection of soil, climatic conditions, plowing, the seed and root beds, drainage, irrigation, holding the moisture, planting the seed, spacing and thinning, cultivating, hoeing, harvesting, crop rotation, fertilizers, live stock, and by-products.

Sugar-beet growing under humid conditions, C. O. TOWNSEND (*U. S. Dept. Agr. Farmers' Bul.* 568 (1914), pp. 20, figs. 4).—This consists of instructions for the production of sugar beets under humid conditions.

Fertilizing sugar beets in the drill, 1912, J. GYÁRFÁS (*Kísérlet. Közlem.*, 16 (1913), No. 3, pp. 367-380, fig. 1).—This reports work in progress in which superphosphate and nitrate of soda, drilled with the seed, seemed to have a beneficial influence on the germination of the seed and development of the young plants.

Nitrate of soda in the cultivation of sugar beets (*Sucr. Indig. et Colon.*, 82 (1913), No. 5, pp. 107-109).—One application of nitrate of soda at seeding time gave larger yields of beets of greater density than when part was applied at thinning time.

Increasing crop production by means of a stimulant, A. STUTZER (*Bl. Zuckerrübenbau*, 20 (1913), No. 14, pp. 209-211).—The author discusses the plant stimulants and gives the results of applying to sugar beets 4 kg. of lead nitrate in a fertilizer furnishing 50 kg. of P_2O_5 , 80 kg. K_2O , and 45 kg. of nitrogen per hectare. An increased yield of 398 kg. from one field and 171 kg. from another was attributed to the use of the lead nitrate.

The nitrogen content of beet sugar and of molasses, E. SAILLARD (*Sci. Agron.*, 30 (1913), No. 1, pp. 27-35).—Tabulated results of nitrogen determinations of numerous varieties covering a period of years in a study of the climatic effects are given.

More total nitrogen was found in a dry year than during a wet year. This nitrogen was in ammoniacal and amid forms rather than in the injurious forms, while the increase of albuminoids was less marked than that of the other forms. It is noted that these results coincide with the increase of albuminoids found in wheat in dry years.

The same was found to be true in regard to molasses. That produced in a dry season, 1911, contained 2.62 per cent of total nitrogen, while in the wet season of 1910 it contained only 2 per cent.

A comparison of some seedling sugar canes with the Bourbon variety in Barbados, J. R. BOVELL (*West Indian Bul.*, 12 (1912), No. 1, pp. 357-360).—The results of trials covering a period of 14 years are given. These indicate a superiority of seedlings B 208 and B 147 over the customary White Transparent of from 6.5 to 24.4 per cent.

Bourbon and seedling canes, J. W. ARBUCKLE (*Dept. Agr. Trinidad and Tobago Bul.* 11 (1912), No. 70, pp. 30-33).—In this article the author discusses the superiority of seedling canes over the old variety, Bourbon, which has practically succumbed to disease.

Sugar cane on savanna lands, R. S. CUNLIFFE (*Cuba Mag.*, 4 (1913), No. 10, pp. 464-470, figs. 6).—Fertilizer trials at Manacas, Cuba, on light soil heretofore considered worthless for sugar-cane culture are reported.

The plat receiving 200 lbs. nitrate of soda, 214 lbs. dried blood, and 416 lbs. basic slag per acre yielded 55,882 lbs. cane, as compared with 10,770 lbs. on the check plat, and an increased profit of \$38.81 per acre. The plat receiving in addition 120 lbs. sulphate of potash yielded 67,973 lbs. per acre, and a profit of \$49.87 over the check plat. The plat receiving 300 lbs. sulphate of ammonia, 170 lbs. double acid superphosphate, and 120 lbs. sulphate of potash yielded 62,106 lbs., and a profit of \$56.02 over the check plat, and the plat receiving in addition to this 400 lbs. nitrate of soda, 170 lbs. double acid phosphate, and 120 lbs. sulphate of potash, yielded 88,576 lbs., and a profit of \$61.50 over the check plat.

Analysis of the cane juice showed for the 5 plats a respective sucrose content of 17.7, 19.12, 18.89, 19.02, and 19.08 per cent, and purity coefficients of 89.65, 89.77, 90.82, 92.78, and 91.29 per cent.

On the manuring of swedes, J. PORTER (*Herefordshire County Council Farmer's Bul.* 4 (1910), pp. 4).—In these experiments, larger yields in general were produced with 6 cwt. of superphosphate per acre than with a combination of 4 cwt. of superphosphate and 2 cwt. of bone flour, or 4 cwt. of superphosphate and 2 cwt. basic slag, but the quality of the roots seemed best with the basic slag mixture. The dressing which gave the greatest yield was $\frac{1}{2}$ cwt. sulphate of ammonia, 6 cwt. superphosphate (30 per cent), and $\frac{1}{2}$ cwt. sulphate of potash. The addition of potash seemed to increase the yield on an average of $18\frac{1}{2}$ cwt. per acre.

The inheritance of certain quantitative characters in tobacco, H. K. HAYES (*Ztschr. Induktive Abstam. u. Vererbungslehre*, 10 (1913), No. 1-2, pp. 115-129, figs. 8).—The author here gives results of continued work (*E. S. R.*, 29, p. 536) on the inheritance of leaf number in F_2 generations of crosses between Sumatra \times Broadleaf and Cuban \times Havana tobacco. The conclusions drawn are as follows:

"Number of leaves per plant is a stable character and little affected by changes of environment. The F_1 generation is of intermediate value, the mean for leaf number being almost exactly equal to the average of the parental means. The F_1 generation is no more variable than the parents. Different variates in F_1 give similar results in F_2 showing the F_1 variation to be of no germinal value. The F_2 generation is much more variable than the parents or F_1 . Some of the F_2 generation breed true in F_3 , giving no greater variability than the parents themselves, others give an intermediate variability between that of the parents and F_2 , and others are as variable as the F_2 generation itself. Intermediates as well as extremes may breed true. Of the 3 F_2 gen-

erations which bred true for leaf number, giving no greater variation than the parents, 2 were intermediates.

"These results give further confirmation of the hypothesis that the inheritance of quantitative characters, such as size, shape, and number of various plant organs may be due to the interaction of a multiplicity of factors, each inherited separately and capable of adding to the character, the heterozygous condition being half the homozygous. The difficulty of determining the number of factors involved is very great, owing to the obscuring effect of fluctuating variability."

A bibliography is appended.

The origin of *Triticum monococcum*, A. SCHULZ (*Ztschr. Gesam. Getreidew.*, 4 (1912), No. 11, pp. 307-309).—Continuing earlier work (E. S. R., 26, p. 827), this article briefly discusses the appearance of 2 subspecies of this plant, one in Europe and the other in Asia.

A Riéti hybrid of wheat, SCHRIBAUX (*Bul. Soc. Nat. Agr. France*, 72 (1912), No. 7, pp. 636-640).—A method of producing a hybrid by crossing the Riéti and Japhet varieties of wheat is described. The hybrid proved to be very precocious, awnless, and adapted to the southeastern part of France.

Farmers' experiment plats, H. ROSS ET AL. (*Agr. Gaz. N. S. Wales*, 24 (1913), No. 4, pp. 277-294).—In continuation of work already noted (E. S. R., 27, p. 840), this report gives the results of farmers' wheat experiments, including variety, manurial, and cultural tests in 4 different districts.

Some experiments and observations on the control of [germination of] seeds, H. PIEPER (*Fühling's Landw. Ztg.*, 62 (1913), No. 10, pp. 361-367).—In experiments on the influence of light on the germination of *Poa pratensis* and *Apera spica venti*, exposure to the light during the whole of 7 days gave a higher percentage than any less number of days of light, or than darkness during the entire period. Hulled seed germinated better in both light and darkness than did unhulled seed. With *Lolium westerwoldicum* there was little difference in the germination between seeds that had been swollen in light for 24 hours and those germinated in both light and darkness. With seeds of *P. pratensis* those rubbed out of the panicle germinated better in the darkness than those either pulled out or left intact, while in the light there was practically no difference in the 3 conditions. Both *L. italicum* and *L. westerwoldicum* germinated better on blotting paper in light than in darkness. Barley and spring wheat germinated better in a temperature of from 10 to 12° C. than at 20°.

Wild oats, E. RABATÉ (*Prog. Agr. et Vit. (Ed. l'Est-Centre)*, 34 (1913), No. 32, pp. 166-180, figs. 5).—In a study to determine methods of eradication of this weed and hybrids with cultivated varieties, the author reached the following conclusions: Severe winters tend to decrease its appearance. Deep plowing, with thorough surface cultivation, does much to destroy it during the present season, but favors its appearance in succeeding cereal crops. It is not advisable to sow oats, wheat, or clover on soils that are known to be badly infested with wild oats, but cultivated crops should be planted for at least 2 years, with clean cultivation.

Other less effective methods of combating the weed were hand hoeing, planting in drills to allow of spraying with a 10 per cent solution of sulphuric acid, pulling in April or May, removing the panicles early in June, cutting the crop green, destroying the chaff from the threshed grain, and burning the stubble.

The influence of corn flower (*Centaurea cyanus*) on the harvest of winter rye and barley, A. CHREBTOW (*Trudy Būro Prikl. Bot. (Bul. Angew. Bot.)*, 6 (1913), No. 5, pp. 344-348).—In this experiment the plats were sown to vary-

ing quantities of the cereals and weed seed. The largest quantity of weed seed used showed a marked injurious effect on the grain and straw production, causing from one-fourth to one-third decrease in yields.

HORTICULTURE.

Manual of colonial horticulture, A. CHEVALIER, P. TEISSONNIER, and O. GAILLE (*Vég. Utiles Afriques Trop. Franç.*, No. 8 (1913), pp. XXXVII+435, figs. 36).—A popular cultural and descriptive manual of tropical plants and temperate climate plants adapted for culture in the Tropics, including vegetables, fruits, flowers, shrubs, and ornamental trees. A note on the culture of vegetables in the French Sudan, together with a bibliography of general works and special publications on tropical cultures, is appended.

A study of monocotyls relative to the growth of cuttings and grafting, O. SCHUBERT (*Centbl. Bakt. [etc.]*, 2. Abt., 38 (1913), No. 13-18, pp. 309-443, figs. 22).—The author here reports in detail a study of asexual reproduction in the superficial organs of monocotyls. The investigation, which was conducted at the plant physiological laboratory at Munich during 1909 and 1910, included the actual propagation of various monocotyls accompanied by a microscopical study of anatomical conditions in the cuttings and grafts, together with a review of the literature on the subject. A bibliography is appended.

In discussing the phenomenon of regeneration the plants are considered according to the nature and mode of their reproduction. The following three types of reproduction by cuttings are recognized: Cuttings in which root formation takes place on the shoot axis itself, either from adventitious roots or from latent roots already present; those in which the roots develop at the base of the side shoots; and those in which roots develop on the leaves. Variations within these types are also considered.

Summing up the past and present results secured in grafting experiments with monocotyls the author concludes that thus far a successful method of grafting has not been evolved.

Has sulphur a direct growth effect on plants? W. JANICAUD (*Gartenwelt*, 18 (1914), No. 3, pp. 29-32, figs. 4).—In pot experiments with tomato plants conducted at the horticultural experiment station at Mülhausen, Alsace, sulphur was used as a fertilizer, both alone and in combination.

As compared with the growth of plants receiving no fertilizer, sulphur used alone at the rate of 2 gm. of flowers of sulphur to 1 kg. of soil appeared to have a somewhat deleterious effect on growth. On the other hand, when used in combination either with ammonium sulphate or with a complete fertilizer a much greater growth was secured than where either of these was used without sulphur. Determination of the dry substance in the various plants as made by Gronover appeared to confirm these results. Likewise a bacteriological investigation by Hiltner indicates that sulphur has a favorable influence on the development of bacteria in soils.

Hotbeds, L. G. HERRON (*Oklahoma Sta. Circ.* 23 (1913), pp. 8, figs. 3).—This circular contains instructions for the construction, care, and management of hotbeds, including details relative to the cost of construction.

The chayote (*Sechium edule*), I. BALDRATI (*Agr. Colon. [Italy]*, 8 (1914), No. 1, pp. 38-55, figs. 2).—An account of the chayote with reference to its botany, varieties, culture, food value, and methods of preparing for the table. A bibliography is included.

Kale fertilizers, T. C. JOHNSON (*Virginia Truck Sta. Bul.* 9 (1913), pp. 175-203, figs. 11).—This bulletin gives the plan in detail of a combined fertilizer, soil management, and cropping system experiment with truck crops started by

the station in 1908 in cooperation with the Bureau of Plant Industry. Results are also presented in tabular form and discussed, showing the effects of the various treatments as measured by a crop of kale grown during the season of 1912-13. The results obtained from crops previously grown are to be published elsewhere.

Thus far no definite conclusions are drawn as to the best fertilizer formula for kale. The results indicate in general, however, that a complete fertilizer should be used and that the highest yields will be secured when the soil is kept in good tilth by supplementary manure and humus treatments, such as crimson clover and lime or stable manure and lime.

Study on the crossing of peppers (*Capsicum annuum*), S. IKENO (*Ztschr. Induktive Abstam. u. Vererbungslehre*, 10 (1913), No. 1-2, pp. 99-114, figs. 4).—The author reports his observations on F_2 pepper crosses, with special reference to color of flower, inflorescence, fruit stem, color and length of fruit, and hairiness.

Crosses of violet and white petaled flowers segregated according to Mendel's law, violet being dominant. Violet and mosaic violet-white petal colors were always combined with dark violet and blackish leaf and stem colors and white petals with green leaves and stems. Umbelliferous inflorescence was recessive to nonumbelliferous in the hybrid *C. annuum* \times *fasciculatum* and its reciprocal. Erect position of the fruit stem was dominant in the flowering stage while the pendant position dominated in the fruiting stage. In crosses of red and orange fruited forms red was always dominant. Both the length and hairy characters showed all gradations between the 2 parents, indicating that these characters had to do with more than one genetic factor, at least in the crosses studied.

A B C of fruit growing, S. H. DIXON (*Texas Dept. Agr. Bul.* 32 (1913), pp. 160, figs. 61).—This is a popular guide to the culture and care of various orchard and small fruits with special reference to Texas conditions. Lists are given of varieties adapted to various sections of Texas, together with varieties of fruits which have originated in Texas.

Varieties of fruit for Arkansas, H. E. TRUAX (*Arkansas Sta. Bul.* 116 (1914), pp. 577-590, figs. 3).—This bulletin contains a descriptive list of thoroughly tested varieties of orchard and small fruits for culture in Arkansas. In preparing the list considerable weight has been given to the experience of reliable fruit growers in each section of the State.

Viticulture in Hungary, F. DE LÓNYAY (*Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases*, 4 (1913), No. 8, pp. 1142-1149).—A brief descriptive and statistical review of viticulture in Hungary, including measures which have been taken to promote the welfare of the industry.

Orange culture in Montevideo, A. ABELLA (*Min. Indus. [Uruguay] Insp. Nac. Ganaderia y Agr. Bol.* 7 (1913), pp. 48, figs. 19).—The author here describes the method of growing and handling oranges on a typical plantation in Montevideo and offers suggestions relative to the improvement of present practices.

Cocoa, its cultivation and preparation, W. H. JOHNSON (*London, 1912, pp. IX+186, pls. 12*).—In the present treatise the author discusses the historical development of the cacao industry; the botanical, climatic, and soil requirements of cacao trees; the establishment, culture, and care of cacao plantations; the results of manurial experiments in various countries; diseases and their control; harvesting and transporting; cacao fermentation and fermentation processes in various countries; washing and sun drying cacao; yield and expenditure; and the manufacture and uses of commercial cacao.

Researches into some statistics of Coffea. P. C. VAN DER WOLK (*Ztschr. Induktive Abstam. u. Vererbungslehre*, 10 (1913), No. 1-2, pp. 136-150, figs. 4; 11 (1913), No. 1-2, pp. 118-127, figs. 5).—In these two articles the author reports a biometric study, conducted at the Buitenzorg Experimental Gardens, of fluctuating variability in leaf length and internodal length in coffee plants.

Sweet peas up-to-date. G. W. KERR (*Philadelphia*, 1914, rev. ed., pp. 88, figs. 14).—The author here presents descriptive lists of all known varieties of sweet peas, including novelties for 1914. Notes on the culture and training of sweet peas are also given. The descriptions are based upon observations made at the Fordhook Farms, Bucks County, Pa., trial grounds during the past 6 seasons, as well as previous experience in England.

New roses. ROSE G. KINGSLEY (*London and New York* [1913], pp. 161-178).—This pamphlet is offered as a supplement to the author's previous book on roses (*E. S. R.*, 21, p. 335), and contains descriptive lists of the more important roses which have appeared since 1908.

Insecticides and fungicides. E. P. FELT (*N. Y. State Mus. Handbook* 18 (1913), pp. 24).—This pamphlet contains directions for the preparation and use of the more important insecticides and fungicides, together with a bibliography of entomological publications issued by the New York State Museum.

Spraying calendar for 1914. J. G. HALL and M. A. YOTHERS (*Washington Sta. Popular Bul.* 59 (1914), folio).—Concise instructions are given for the treatment of the principal pests and diseases of orchard fruits, including directions for the preparation of spray mixtures.

The new local option orchard and small fruit inspection law (*Arkansas Sta. Circ.* 18 (1913), pp. 4).—This circular contains the text of an act of the general assembly of the State of Arkansas, approved April 2, 1913, to prevent the increase and scattering of insect pests and plant diseases injurious to horticultural plants and crops.

The act creates a state board of orchard inspection, composed of the director, entomologist, and plant pathologist of the station, and provides for inspection in any township where the majority of the electors voting approve the adoption of the act at a general election for state and county officers. Whenever three-fourths of the townships of any county shall have adopted the provisions of the act, they are to be extended to the entire county.

FORESTRY.

Shortleaf pine in Virginia.—The increase in its yield by thinning, W. W. ASHE (*Richmond, Va.: Dept. Agr. and Immigr.*, 1913, pp. 44, pls. 7).—The author here presents the results of a survey of the second growth shortleaf pine in old fields in the middle portion of Virginia. The survey was conducted cooperatively by the Forest Service of the U. S. Department of Agriculture and the State of Virginia to ascertain the value of this shortleaf pine timber for lumber uses, to determine the effect of lumbering on the future yields of the stands and whether conservative methods of cutting could be employed profitably, to determine the yield of stands of different ages, to recommend methods of thinning and cutting to accelerate growth, and to devise methods of protection for young growth.

The subject matter is discussed under the following general headings: Distribution and importance, condition and position of old-field stands, management, thinnings, production of cordwood from thinned and unthinned stands, production of saw timber, value of trees and stands, waste in cutting small trees, lumbering and restocking, planting waste lands, and the protection of stands.

The investigation shows as a whole that shortleaf pine is already one of the chief sources of building material on the farms. If young stands are protected, full stocking secured, and the stands subsequently thinned, the yield of saw timber from a 40-year-old stand can be more than doubled and its value greatly increased, thereby furnishing a means of permanent income from the farm woodlots.

White pine under forest management, E. H. FROTHINGHAM (*U. S. Dept. Agr. Bul. 13 (1914), pp. 70, pls. 7*).—This bulletin summarizes the most important facts relative to white pine with regard both to the original forest and to the second growth. Yield tables for second growth stands based on measurements made in southern New Hampshire by C. A. Lyford and L. Margolin are given, and from these data tables are derived showing the value of stumpage at prevailing prices and the profit or loss resulting from the management of second growth under favorable and unfavorable conditions. Methods are suggested for securing the successive crops and for increasing the quantity and quality of the yield. Chapters on Direct Seeding and Protection from an unpublished report on white pine by A. K. Chittenden and J. S. Ames are also given.

Owing to the success with which white pine lends itself to management, the relatively steady market, and the small amount of waste in lumbering, it is concluded that under widely varying conditions of quality and accessibility and with the prevailing tax rates, market value, and wages, the raising of white pine to ages of from 35 to 70 years is a profitable undertaking at 4, 5, 6, and sometimes 10 per cent compound interest.

Yellow poplar in Tennessee, W. W. ASHE (*Tenn. Geol. Survey Bul. 10-C, 1913, pp. 56, figs. 8*).—This embraces the results of a survey of second growth poplar stands in Tennessee, conducted cooperatively by the Forest Service of the U. S. Department of Agriculture and the State Geological Survey, with special reference to determining the rate of growth of the young timber, the possible profit in growing it, and the best methods of management for accelerating its growth and increasing its value. The principal phases discussed are commercial outlook, distribution, forest characteristics, silvical characteristics, growth, increasing the yield from timber land by management and better utilization, and the establishment of yellow poplar plantations, including cost estimates.

The investigation as a whole shows that not only is there an assured and remunerative market for the timber of small-sized trees but its rate of growth is so rapid that returns are obtained at an early period for a forest tree.

Notes on tapping experiment at Gunong Angsi, F. G. SPRING (*Agr. Bul. Fed. Malay States, 2 (1913), No. 5, pp. 119-123*).—The second year's results from tapping experiments with Para trees at Gunong Angsi (E. S. R., 28, p. 239) show that tapping in adjacent quarters not only gives a higher yield than tapping in opposite quarters, but that it is a much more economical system to adopt. A 2-year bark renewal system is more expensive and less satisfactory in yield of rubber than a 4-year bark renewal system. Trees tapped in adjacent quarters showed a considerable increase in girth over trees tapped in opposite quarters. The yield of rubber and girth of trees growing at an elevation of 300 ft. were somewhat greater than for trees growing at an elevation of 1,000 ft. In this connection attention is called to the fact that the trees growing at the lower altitude are spaced 25 by 23 ft., as compared with 15 by 15 ft. for trees at the higher altitude.

The cultivation of the Tung tree (China wood oil) in the United States, D. FAIRCHILD (*Paint Manfrs. Assoc. U. S. Bul. 33, pp. 4-19, figs. 6*).—An account of the experiments of the Bureau of Plant Industry of the U. S. Department of

Agriculture in the introduction of the Chinese wood-oil tree (*Aleurites fordii*). A subsequent account of this work has been noted (E. S. R., 28, p. 843).

On some timbers which resist the attack of termites, R. KANEHIRA (*Indian Forester*, 40 (1914), No. 1, pp. 23-41).—The author here presents a list of construction timbers which have been found resistant to the attack of termites in various tropical countries, together with a list of seasoned and unseasoned Formosan timbers showing their relative immunity when inspected at intervals of 6 months and a year after burying. From the experiments thus far made it is concluded that the termite resistance of various timbers may be due to the presence in the wood of certain species of some substance with a strong smell or taste disagreeable to insects; to the presence of poisonous substances in certain species; and to the extreme hardness of the wood in others.

A bibliography of reference works is given.

The lumber industry (*Thirteenth Census U. S.*, 10 (1910), pp. 485-508, figs. 2).—This comprises both detailed and summarized statistical reports on the lumber industry of the United States, compiled from data secured in 1910 but relating to the year 1909. The data given include 4 classes of establishments, namely, logging camps and merchant sawmills, including planing mills where operated in connection with sawmills; independent planing mills; wooden packing-box factories; and custom sawmills. These establishments are considered with reference to number; persons engaged in the industry, either as proprietors or employees; primary horsepower; capital; wages; cost of materials; value of products; and value added by manufacture. Comparative data are also given for previous census periods.

The total number of establishments reporting was 44,804; the number of persons engaged in the industry, 797,825; the amount of capital invested, \$1,182,330,552; the value of products, \$1,160,644,628; and the value of products less cost of materials, \$652,425,475. The statistics relative to lumber, lath, and shingle production correspond to those previously issued (E. S. R., 25, p. 240).

Wood-using industries of Ohio, C. W. DUNNING (*Ohio Sta. Wood-Using Indus.*, 1912, pp. 133, figs. 30).—This report comprises the results of a survey of the wood-using industries of Ohio, conducted cooperatively by the Forest Service of the U. S. Department of Agriculture and the Ohio Station. The data given and discussed show the consumption and value of domestic and imported woods by species and by industries, including also the kinds of woods used by each industry, and the average cost per thousand feet. A list is also given showing the use of domestic and foreign woods in the manufacture of various articles, together with a directory of wood-using manufacturers.

In order to make the report more complete the statistics of the Bureau of the Census referring to Ohio have been compiled and are here given.

Wood-using industries of New York, J. T. HARRIS (*N. Y. State Col. Forestry, Syracuse Univ.*, Ser. XIV, No. 2 (1913), pp. 213, pls. 7).—This report comprises the results of a survey similar to the above of the wood-using industries of New York, conducted cooperatively by the Forest Service of the U. S. Department of Agriculture and the New York State College of Forestry.

Wood-using industries of South Carolina, S. L. WOLFE (*Columbia, S. C.: Dept. Agr., Com., and Indus.*, 1913, pp. 53, pls. 14).—This is an investigation similar to the above of the wood-using industries of South Carolina, conducted cooperatively by the Forest Service of the U. S. Department of Agriculture and the Department of Agriculture, Commerce, and Industries of the State.

DISEASES OF PLANTS.

The parasitology of agricultural plants, M. NEVEU-LEMAIRE (*Parasitologie des Plantes Agricoles. Paris, 1913, pp. XII+720, figs. 430*).—In this work the

author describes the parasites occurring on some of the principal field, forage, and garden crops, discussing them as far as possible in the systematic order of the parasites. The first part of the book is devoted to plant parasites, while the second treats of animal parasites. Following the description of each species, the pathogenic rôle is indicated. A list is given of the host plants, the different parasites being classified according to the part of the host plant attacked.

Report of committee on fungus diseases for 1911, F. D. HEALD (*Texas Dept. Agr. Bul.* 22 (1911), pp. 158-163).—The author lists as sufficiently abundant to attract very general attention the following diseases:

Powdery mildew of rose (*Sphaerotheca pannosa*), rose leaf blotch (*Aclonema rosea*), apricot scab or freckle (*Cladosporium carpophilum*), bacterial blight of geraniums (species not yet determined), blossom-end blight of the watermelon (cause not definitely known), bacterial canker of plum (species not yet determined), and dieback or winterkilling of peach, plum, and apricot (*Valsa leucostoma*).

Remedial measures are suggested in connection with each disease.

Suppression of plant diseases—Ireland and international action (*Dept. Agr. and Tech. Instr. Ireland Jour.*, 13 (1913), No. 4, pp. 661-664).—The successful handling of the situation regarding international trade caused by the recent appearance of black scab of potatoes in Ireland is cited and discussed in its bearings upon a possible international arrangement in view of this and related dangers, with a brief account of measures taken or contemplated to that end.

The powdery mildews—Erysiphaceæ, G. M. REED (*Trans. Amer. Micros. Soc.*, 32 (1913), No. 4, pp. 219-258, pls. 4).—The author describes the general characteristics of the Erysiphaceæ, the group of fungi to which the powdery mildews belong, and gives accounts of the development of the perithecium, host distribution, biological specialization, economic importance, and pathological effects of the powdery mildews. The classification of the species is treated at length, keys for their identification being given. A host index and a bibliography of literature are included.

Ramularia, Mycosphærella, Nectria, and Calonectria, H. W. WOLLENWEBER (*Phytopathology*, 3 (1913), No. 4, pp. 197-242, pls. 3).—The results of a morphological and pathological study on the differentiation of species of fungi belonging to these groups are given.

So far as pure culture investigations are concerned, the author found that among the Ascomycetes septocylindrical conidia were wanting in *Fusarium* proper but occur in certain sections of *Nectria*, *Hypomyces*, *Mycosphærella*, etc. *Hypomyces* is said to divide itself readily into several sections, which are described. The genus *Ramularia* is said to embrace a number of wound parasites. *Septocylindrium* does not differ in any material way from *Ramularia* and they should be combined.

According to the author, *N. galligena*, the cause of canker of fruit and other deciduous trees in Europe, and *C. graminicola*, which produces the snowy mold of cereals, are present in the United States.

Notes on cultures of three species of *Peridermium*, G. G. HEDGCOCK and W. H. LONG (*Phytopathology*, 3 (1913), No. 4, pp. 250, 251).—Accounts are given of infection experiments with species of *Peridermium* in which the alternate hosts were determined. Sowings of æcidospores of *P. inconspicuum* on *Coreopsis verticillata* showed infection, and the name for the fungus, based upon this form, is given as *Coleosporium inconspicuum* n. comb. In addition *P. delicatulum* from *Pinus rigida* was found to grow on *Euthamia graminifolia*, and the name *C. delicatulum* n. comb. is given for the fungus. The connection

between *Peridermium stalactiforme* on *Pinus contorta* and *Castilleja linearis* is shown by successful cultures.

An undescribed species of *Peridermium* from Colorado, G. G. HEDGCOCK and W. H. LONG (*Phytopathology*, 3 (1913), No. 4, pp. 251, 252).—*P. betheli* n. sp. occurring on *Pinus contorta* is described.

Alfalfa leaf spot disease, T. G. B. OSBORN (*Jour. Dept. Agr. So. Aust.*, 17 (1913), No. 3, pp. 294-296, figs. 4).—This disease of *Medicago sativa*, caused by *Pseudopeziza medicaginis*, is said to have been noted on a farm of the department at Turretfield in December, 1912.

Frequent cutting and early removal of the hay is recommended so as not to leave many dead leaves. In case of severe infection, burning of the cut and dried hay (adding a layer of straw if necessary) is recommended. It is thought that this disease may be spread in soil used to convey nodule bacteria or else in the seed.

It is said not to be definitely known whether *P. trifolii* (which produces a very similar leaf spot disease of clover) is capable of infecting alfalfa.

A new fungus disease of clover, A. BONDARTSEV (*Zhur. Bol'ezni Rast.*, 7 (1913), No. 1-2; *abs. in Riv. Patol. Veg.*, 6 (1913), No. 6, p. 178).—The author describes a fungus said to be parasitic in clover blossoms in parts of Russia. The species has been named *Botrytis anthophila* n. sp.

Report of the botany division, H. W. BARRE (*South Carolina Sta. Rpt. 1913*, pp. 14-20).—In the cotton anthracnose investigations, it was found that the planting of seed from bolls obtained from stalks showing any disease whatever is an unsafe practice. Plants grown from seed taken from healthy stalks have been free from disease. Laboratory and field tests with diseased seed have shown that the centrifuge and germination tests are safe indicators of the presence of disease, but no basis has been formed for determining the amount of disease to be expected from a given sample of seed. The work in seed treatment for the control of the disease has been continued, and although treated with concentrated sulphuric acid until the lint was completely destroyed, a considerable amount of disease was developed from seed taken from diseased stalks but on bolls showing no definite signs of the disease. In the progress of this investigation different strains of the anthracnose fungus (*Glomerella gossypii*) have been secured, and it is thought that probably the variation in the amount of disease in the same varieties of cotton from year to year may be due to the virulence of the fungus. A survey of the State shows that the anthracnose is present in every county in the State.

The investigations begun on cotton shedding have been continued, and several new phases of the problem have been studied under controlled conditions. It has been found that the fertility of the soil is a decided factor in the amount of water required to produce a pound of seed cotton, the amount varying from 80 to 125 gal. of water for 1 lb. of seed cotton, and depending on soil fertility and other soil conditions. The second year's experiments in irrigation confirmed the conclusion of the previous year that soil moisture is an important factor in cotton shedding. Considerable data have been collected on the relation between leaf area, transpiration, shedding, and yield.

The cotton and cowpea wilt work, carried on in cooperation with the Bureau of Plant Industry of this Department, is briefly described, and notes are given on the work of the pathological inspection and plant disease survey.

Texas root rot of cotton, F. D. HEALD (*Texas Dept. Agr. Bul. 22* (1911), pp. 303-308).—Besides a brief discussion of sore shin (*Rhizoctonia* spp.) and cotton wilt (*Fusarium vasinfectum*), more particular attention is given to Texas root rot of cotton (*Ozonium omnivorum*). This is said to attack also many wild and cultivated plants, cereals furnishing an exception. As a means

of combating this fungus, a three years' succession of wheat, corn, and sorghum is recommended. Aeration of the soil by deep fall plowing has also been found effective.

A new type of bacterial disease, E. F. SMITH (*Science*, n. ser., 38 (1913), No. 991, p. 926).—A brief description is given of a disease of orchard grass formerly described by Ráthay (E. S. R., 11, p. 759). This disease is of bacterial origin and the growth first develops as a thick layer on the surface of the plant, later penetrating into the interior. It is proposed to call the organism, which has been isolated, *Aplanobacter ráthayi* n. sp.

Diseases affecting potatoes, M. T. COOK (*Ann. Rpt. N. J. Bd. Agr.*, 40 (1912), pp. 155-161).—Besides a brief discussion of the various potato diseases infesting or threatening this section, with known or suggested remedies, the author proposes the organization of a potato growers' association for the State with a view to protecting this crop from disease in New Jersey.

Report on the prevalence of potato blight in Ireland up to mid-July, 1913 (*Dept. Agr. and Tech. Instr. Ireland Jour.*, 13 (1913), No. 4, pp. 732-734).—It is stated that while potato blight was reported from different counties, the disease showed no tendency to spread rapidly. Outbreaks were confined chiefly to early varieties, owing probably to the backwardness of the crop, favorable weather, and more general spraying. Investigations are reported as still in progress regarding black stalk rot, stalk disease, and yellowing, which in recent years have caused considerable injury to the potato crop, especially in the west of Ireland.

Spraying tests against potato blight, G. QUINN (*Jour. Dept. Agr. So. Aust.*, 17 (1913), No. 3, pp. 301-306).—Giving results of several series of experiments, a number of which were contradictory and inconclusive, the author states that the history of the disease seems to indicate that in very dry climates it is problematical whether it pays in the long run of years to spray potatoes against Irish blight if the crops be grown during the summer months.

Further contribution to the study of *Fusarium* leaf roll of potato, W. HIMMELBAUR (*Österr. Ungar. Ztschr. Zuckerindus. u. Landw.*, 42 (1913), No. 5, pp. 711-736, pl. 1, figs. 8).—Further study (E. S. R., 28, p. 848) is claimed to support the view that this disorder is due to a *Fusarium*. The varieties most resistant to the attack were those which most quickly formed cork on wounded surfaces. A temporary rolling of the leaves, it was found, may be produced by injury to the vascular bundles. Wounding the lower portion of the stem showed no considerable effect on the yield of tubers.

The pathological anatomy of potato scab, B. F. LUTMAN (*Phytopathology*, 3 (1913), No. 5, pp. 255-264, figs. 10).—Attention is called to the fact that most of the studies on the potato scab have been concerned with methods of prevention, and the author gives an account of his investigations on the pathology of the disease.

He finds that scabs may originate at any place on the potato, frequently occurring at the lenticels. The scab is due to the hypertrophy of the cells of the cork cambium. A surface view of the brown spots on the skin of scabby potatoes and very young scabs show the thread-like filaments of the fungus which apparently produces the disease. The carbon compounds stored in the diseased tissues consist of a large number of fat globules instead of the usual starch grains.

The efficiency of formaldehyde in the treatment of seed potatoes for *Rhizoctonia*, W. O. GLOYER (*New York State Sta. Bul.* 370 (1913), pp. 417-431, pl. 1).—The author investigated the relative efficiency of the standard scab treatments in the disinfection of seed potatoes affected with *Rhizoctonia*, for-

maldehyde gas, formaldehyde solution, and corrosive sublimate solution being compared.

It was found in laboratory experiments that neither formaldehyde gas nor solution can be depended upon to kill all the *Rhizoctonia sclerotia*. This seems to be due to the inability of the formaldehyde to penetrate to the center of the larger and more compact sclerotia. The standard corrosive sublimate treatment, on the contrary, was found thoroughly efficient, and even when used in a strength of 1:2,000 the corrosive sublimate solution killed all the *Rhizoctonia sclerotia*. The author concludes that when it is desired to treat seed potatoes for *Rhizoctonia* the corrosive sublimate should be used.

The injurious effect of formaldehyde gas on potato tubers, F. C. STEWART and W. O. GLOYER (*New York State Sta. Bul. 369 (1913), pp. 385-416, pls. 2*).—In 1912 the authors undertook the disinfection of a quantity of seed potatoes by the formalin-permanganate method, and as a result a great amount of injury was caused. Investigations were subsequently inaugurated to determine the cause of the injury, temperature, relative humidity, quantity of potatoes in proportion to space, and varietal differences being studied. It was found that the chief cause of the injury was the small quantity of potatoes per cubic foot of space in the fumigation chamber, although high relative humidity and the sprouted condition of the potatoes were important accessories.

Other experiments were carried on which have demonstrated the cause of the injury and how to avoid it. It was found that potatoes absorb a considerable quantity of the gas, resulting in two forms of injury, one called lenticel spotting and the other where the eyes are affected. In the experiments lenticel spotting occurred with all quantities of tubers used up to 12 lbs. per cubic foot, but no eye injury appeared when 5 lbs. or more per cubic foot were used. The effect of the lenticel spotting on germination and growth has not been definitely determined, but it is believed to be without material injury to the tubers for seed purposes.

In view of their experiments the authors recommend the use of gas treatment only where liquid treatments are impracticable, and they recommend as safe and efficient treatment for scab the use of 3 pints of formaldehyde and 23 oz. of permanganate of potash to 167 bu. of potatoes in 1,000 cu. ft. of space.

In the course of the investigations it was found that similar injury to that produced by formaldehyde gas was produced by fumes of ammonia, bromine, or ether, and that strong solutions of formaldehyde and corrosive sublimate had somewhat similar effects. In the use of formaldehyde solution the quantity of potatoes treated had no appreciable influence on the degree of injury, and it was found that the same solution may be used at least ten times without loss of strength.

Certain varieties of apples are also reported as being injured by formaldehyde gas.

Some faults in formaldehyde disinfection of potatoes, F. H. HALL (*New York State Sta. Buls. 369 and 370, popular ed., pp. 10*).—This is a popular edition of the above bulletins.

Diseases of rice, E. J. BUTLER (*Agr. Research Inst. Pusa Bul. 34 (1913), pp. 37, pls. 3, figs. 3*).—A further account (*E. S. R., 28, p. 151*) is given of studies by the author on a disease of rice attributed to a nematode claimed to be new and named *Tylenchus angustus*, which is discussed at some length; also some fungus diseases of rice, including bunt ascribed to *Tilletia horrida*, false smut to *Ustilaginoides virens*, and sterility to *Sclerotium oryzae*.

The important cane fungi in Santo Domingo, J. R. JOHNSTON (*Rpt. Bd. Comrs. Agr. P. R., 2 (1912-13), pp. 29-31*).—The author reports having found the following important cane diseases in Santo Domingo; Root disease, ascribed

to *Marasmius sacchari*, said to be often associated with some other fungi; rind disease, due to *Melanconium sacchari*; red rot of the stem, due to *Colletotrichum falcatum*; pineapple disease, due to *Thielaviopsis paradoxa*; and red spot of the leaf sheath, due to *Cercospora vaginæ*. Some others found caused serious injury only under exceptional conditions.

On the identity of *Bacillus nicotianæ* with *B. solanacearum*, J. A. HONING (*Rec. Trav. Bot. Néerland.*, 10 (1913), No. 2, pp. 85-136, figs. 3).—The author, giving an account of studies on the morphology and parasitic activity of the organism associated with "gummosis," black shank, or bacterial tobacco wilt, states that *B. nicotianæ*, described by Uyeda (E. S. R., 18, p. 151), is identical with that previously described as *B. solanacearum* by Smith (E. S. R., 8, p. 895).

It is stated that this organism may sometimes be observed to lose its virulence, first for *Capsicum annuum*, later for *Nicotiana tabacum*, and finally for *Solanum melongena* and *S. lycopersicum*. This circumstance probably tends to explain the disagreement noted in the reports above mentioned.

Weather and stalk disease of wheat, E. VOGES (*Deut. Landw. Presse*, 40 (1913), No. 83, pp. 993, 994, figs. 3).—The author reports finding on wheat affected with foot rot or stalk disease besides *Ophiobolus herpotrichus* a number of other fungi named, and he holds that in this disease, as probably in some others, different causes may produce very similar results.

A discussion of the weather in connection with the progress of certain crop diseases during the past three years concludes with the statement that weather exerts both direct and indirect influence upon the relations between host and parasite.

Studies on frost injury to fruit trees, P. SORAUER (*Naturwissenschaften*, 1 (1913), Nos. 44, pp. 1055-1058, figs. 4; 45, pp. 1094-1097, fig. 1).—It is stated that even moderate cold is capable of producing wounds in fruit trees in regions of loose cortical tissue, particularly in case of certain varieties named. The attacks of fungi are favored by the lesions produced. Both these features are accentuated in case of quick-growing trees under the influence of nitrogenous fertilizers with free irrigation.

Winter injury in orchards, F. M. CLEMENT (*Ann. Rpt. Quebec Soc. Protec. Plants [etc.]*, 5 (1912-13), pp. 24-26).—The observed effects of expansion and contraction in splitting the bark of fruit trees are discussed in connection with their relation to attack from organisms causing disease. These injuries (believed to favor development of black rot canker and crown rot in apple trees) are said to be prevented or greatly minimized by protecting the trees from strong wind and direct sunshine.

The black spot of the apple and pear, H. M. NICHOLLS (*Agr. Gaz. Tasmania*, 21 (1913), No. 10, pp. 387-401, figs. 6).—Besides a brief illustrated description and biological history of *Venturia inæqualis* and *V. pyrina*, causing black spot respectively of apple and pear, some remedial measures as tried in Tasmania are recommended. These are essentially the same for both fungi and consist in early plowing in of the fallen leaves, harrowing down the surface soon after, leaving it undisturbed until after November 15, and spraying the trees early in October with Bordeaux or Burgundy mixture, or with lime sulphur adding 1 lb. of wheat flour to each gallon of the solution to promote spreading and adhesion. For the control of the disease in packed fruit, good ventilation is said to be usually effective.

Quince blotch and apple fruit spot, C. BROOKS (*Phytopathology*, 3 (1913), No. 4, pp. 249, 250).—The author notes the occurrence on Chinese quince of the fungus *Phoma pome*, and calls attention to the identity of this species with that from the apple and other species of quinces.

Comparative studies of certain disease producing species of *Fusarium*, C. E. LEWIS (*Maine Sta. Bul.* 219 (1913), pp. 203-258, pls. 15).—In a study of apple decays the author found in 1908 two species of *Fusarium* in decaying fruits. Since that time a considerable number of apples have been found in which a *Fusarium* was causing decay. This led to a study of various species of *Fusarium*, forms from 24 sources being investigated at considerable length, and an equal number of additional forms being studied but not reported upon in detail. The growth and cultural characters of the organisms are described and accounts given of the results of inoculation experiments to test the pathogenicity of the various strains on different host plants.

The two species mentioned above as occurring on the apple were found capable of causing the decay. One is considered very similar to, if not identical with, *F. putrefaciens*, a cause of apple decay in Europe. The other species is said to resemble very closely the fungus which causes a rot of carnations, described by Stewart as *Sporotrichum pow* (E. S. R., 20, p. 647), differing, however, from that species by having a larger proportion of septate spores in the apple fungus.

In an appendix to the bulletin, W. J. MORSE gives a list of species studied as determined by Wollenweber, and also a host index that shows a wide range of hosts for the different species. With the possible exception of *F. conglutinans*, all of the strains produced some decay on some varieties of apples.

Is apple scab on young shoots a source of spring infection? W. J. MORSE and W. H. DARROW (*Phytopathology*, 3 (1913), No. 5, pp. 265-269).—There is said to be little unanimity of opinion among investigators as to the part played by young branches and water shoots in the spring occurrence of apple scab. The authors have made a study of this matter, examining a large number of trees, and while they do not wish to be understood as denying that the ascospores formed on the leaves of the previous year are the source of a great proportion of the spring infection of apple scab, it is thought that under certain conditions and with certain varieties of apple trees, diseased twigs and water sprouts are an important factor in the propagation and spread of the disease at the beginning of the following year. Attention is called to the fact that the application of some strong fungicide before the opening of the leaf buds would doubtless greatly reduce infection from this source.

Apple rust found on fruit, A. DE JACZEWSKI (*Bul. Trimest. Soc. Mycol. France*, 29 (1913), No. 1, pp. 165-169, fig. 1; *abs. in Bot. Centbl.*, 123 (1913), No. 5, p. 115).—The author reports finding in September, 1912, on the surface of diseased apples, æcidia characteristic of *Ræstelia*, heretofore supposed to be confined to leaves and branches.

Biologic forms of black knot, E. M. GILBERT (*Phytopathology*, 3 (1913), No. 4, pp. 246, 247).—The author notes the common occurrence of black knot (*Plowrightia morbosa*) on some species of *Prunus*, while it is almost entirely absent from others.

Inoculation experiments with black knots from cultivated varieties of plums were made, using wild plum, choke cherry, and pin cherry. The results of the experiments show that in no instance was there the formation of any structure that could be compared to the typical black knot. It would appear that the black knot of the wild plum and the choke cherry are biological forms and that this may also be true of the form found upon cultivated varieties.

Vine chlorosis and its treatment, L. RAVAZ (*Prog. Agr. et Vit. (Ed. l'Est-Centre)*, 34 (1913), No. 47, pp. 641-652).—Discussing the results of experiments by Mazé with maize (E. S. R., 28, p. 429), and those of the same author in connection with Ruot and Lemoigne (E. S. R., 29, p. 826) on legumes, in which the chlorosis following use of calcium carbonate was relieved on addi-

tion of iron compounds, the author suggests the utilization in connection with grape chlorosis of certain iron bearing soils widely distributed in France.

On the proportion of iron sulphate used against white rot of grapevines, M. BLUNNO (*Rpt. Austral. Assoc. Adv. Sci.*, 13 (1911), pp. 562-566).—The author reports his experience with white rot of the root system of grapevines, associated with *Dematophora necatrix*. Carbon bisulphid applied at the rate of 1 oz. per vine, divided into 5 partial injections, 6 or 8 in. from the stem, was effective during the first stage of the infection, but could not destroy the foci of infection represented by roots of once existing trees, and repeated and stronger doses endangered the vines. Ferrous sulphate applied once annually for 3 successive years at the rate of 8, 16, and 16 oz., respectively, to each vine was sufficient to restore all but 2 vines, in which the chlorosis yielded to a further and slightly modified treatment. This salt is thought to act not only as a fungicide, but as a vigorous stimulant to growth.

The present status of the defensive treatment for cacao canker in Samoa, K. FRIEDERICHS (*Tropenpflanzer*, 17 (1913), No. 10, pp. 571-578).—The author claims that Bordeaux mixture applied carefully and thoroughly in August, October, and December is safely protective against cacao canker ascribed to *Phytophthora faberi*, if in connection therewith care is taken to destroy all parts of badly infected trees and certain insects mentioned.

Gummosis in roots and pods of *Acacia*, L. LUTZ (*Bul. Soc. Bot. France*, 60 (1913), No. 5, pp. 322-324).—Pursuant to a previous report (E. S. R., 7, p. 468), the author states that the succession of phenomena characteristic of the progress of gummosis in *Acacia* is the same in the roots as in the trunk, but in general of later occurrence in the former, as marked by clogging or obliteration of the vessels. Although lesions appeared on the pods, the seeds were not affected.

Twig canker on black birch, C. HARTLEY (*Phytopathology*, 3 (1913), No. 4, pp. 248, 249).—During the winter of 1910 a twig canker was reported as doing serious damage to *Betula lenta* in the New York Zoological Park. The twigs developed considerable swellings and the part beyond the swelling died. An examination of affected material showed the presence of *Sphæroopsis*, *Cytospora*, and *Myxosporium*, and inoculation experiments were carried on with the different fungi.

The results showed some infection, but further inoculations on young rooted trees gave negative results. This is believed to indicate that the *Sphæroopsis*, which seemed to be the most common species, is parasitic only under certain conditions, and that it is improbable that these fungi were concerned in causing the swollen cankers characteristic of the disease.

The chestnut bark disease, H. METCALF (*Jour. Heredity*, 5 (1914), No. 1, pp. 8-18, figs. 8).—The author gives an account of the chestnut bark disease, due to *Endothia parasitica*, suggesting its possible introduction from the Orient, and describes its distribution, manner of infection, symptoms, etc. For the control of the disease it is thought that probably the breeding of immune or highly resistant varieties will be necessary.

The chestnut bark disease on chestnut fruits, J. F. COLLINS (*Science*, n. ser., 38 (1913), No. 989, pp. 857, 858).—The author reports the observation on nuts and burs of the chestnut of reddish-brown pustules resembling those of *Endothia parasitica*. Portions of the diseased fruits were successfully inoculated into the bark of chestnut trees, producing typical infection.

The results of the inoculations indicate that the disease was present on or in the nuts and burs collected, and while diseased nuts are not likely to often reach the market, yet the possibility of the dissemination of the disease in this manner should not be overlooked.

Chestnut blight resistance, R. T. MORRIS (*Jour. Heredity*, 5 (1914), No. 1, pp. 26-29, figs. 2).—The author reports that in 1905 in a chestnut forest in Connecticut there were about 5,000 old American chestnut trees, a few chinquapins (*Castanea pumila*), and two saplings of *C. mollissima*, the Chinese chestnut. When it became evident that the chestnut bark disease was threatening the American chestnut trees an attempt was made to find blight resistant individuals, and plantings were made of 26 different kinds. These included the American species as well as a considerable number of others introduced from Europe and Asia. There were also a number of grafted varieties of different sorts.

In 1913 every one of the old American chestnut trees had become blighted and had been removed, and the younger trees and stump shoots are said to be practically all dead or dying with the blight. The various grafted varieties of European and Asiatic chestnuts showed different degrees of resistance to blight. This was also true of the seedlings of European and Asiatic varieties. None of them appeared to be quite as susceptible to the disease as the American chestnut, but most were affected and ultimately died. The Korean chestnuts and chestnuts from the Aomori region in Japan resisted the blight almost completely until they were about six years old. Since that time they have shown a tendency to attack, but resist the fungus somewhat better than the American chestnut. The Korean and Japanese chestnuts when grafted on American chestnut sprouts all blighted in their second or third year, seeming to indicate that the sap from the American chestnut had made them susceptible to the fungus. A hybrid between the American sweet chestnut and the chinquapin blighted when about 8 years old. None of the American species of the chinquapin, varying from 5 to 13 years, has blighted, with the exception of 2 limbs, which were injured by the falling of another tree upon them. None of the specimens of *C. alnifolia* nor *C. mollissima* has thus far shown any indication of blight.

A number of hybrids between the different species have been made and are being tested for possible resistance. While making these hybrids the author discovered that parthenogenesis occurs among the Castaneas, and incidentally it was found that the same takes place in a number of species of walnut and hickory.

Injury by oak mildew, NIKODEM (*Centbl. Gesam. Forstw.*, 39 (1913), No. 10, pp. 438-440).—A brief account is given of the progress of oak mildew in Croatia, which increased from 1907 to 1911, when it became much less general. A sudden renewal of activity in 1912 and since has been noted in connection with the presence and increase of a leaf wasp (*Emphytus filiformis*), which is discussed in this connection.

Pustule formation on Hevea brasiliensis, J. KUIJPER (*Rec. Trav. Bot. Néerland.*, 10 (1913), No. 2, pp. 137-146, pl. 1, figs. 7).—The author describes an abnormal condition of the cortex, observed on the lower portions of two young rubber trees, and thought to be related to that previously mentioned by Petch (E. S. R., 28, p. 246). Almost no latex is obtained from the roughened portions. The pustules are said to be independent of subcortical buds or injuries so far as known, and to show no connection with the deeper portions of the wood.

Bark rusts of Juniperus virginiana, C. HARTLEY (*Phytopathology*, 3 (1913), No. 4, p. 249).—According to the author, the bark rusts of cedar in the vicinity of Washington, D. C., are mostly due to *Gymnosporangium clavipes*, *G. nidus avis*, and *G. effusum*.

An epidemic of needle diseases in Idaho and western Montana, J. R. WEBB (*Phytopathology*, 3 (1913), No. 4, pp. 252, 253).—The author describes *Lopho-*

dermium pinastri, which is said to be becoming very destructive to white pines and other species in the western National Forests, and also a needle cast of larch which is assuming epidemic form in the Priest River Valley.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Experiments on the destruction of voles (*Bul. Mens. Off. Renseig. Agr. [Paris]*, 12 (1913), No. 4, pp. 399-401; *abs. in Jour. Bd. Agr. [London]*, 20 (1913), No. 7, p. 621).—The damage caused by voles in the eastern districts of France in 1912 led to an appropriation of 250,000 francs for use in combating them. Since the use of Danysz virus was not attended with very satisfactory results experiments were made with the commercial virus, known as "Ratin," on 24 plats covering a total area of 2.3 acres, distributed over a badly infested area of 30,000 acres.

On these plats 321 dead and 178 living voles were found, or a mortality of about 70 per cent. Taking into consideration the rate of reproduction of the voles it is estimated that a mortality of 90 per cent must be attained before the treatment can be considered satisfactory, and this result was obtained on but 4 plats. The virus was most effective on pasture and old stubble. It is concluded that while Ratin may be classed among the preparations useful in the extermination of voles, its general employment can not be recommended. The experiments confirmed previous experience in that treatment on a large scale led to the emigration of the voles.

The relative lengths of the large and small intestines in rodents, T. D. A. COCKERELL, L. I. MILLER, and M. PRINTZ (*Proc. Biol. Soc. Wash.*, 26 (1913), pp. 205-207).—This paper reports the results of an anatomical study of six species of rodents.

Five important wild duck foods, W. L. MCATEE (*U. S. Dept. Agr. Bul.* 58 (1914), pp. 19, figs. 16).—Supplementing information relating to wild rice, wild celery, and pondweeds, previously noted (*E. S. R.*, 25, p. 757), studies are reported on 5 other important plant foods of wild ducks.

The tubers of the Delta duck potato (*Sagittaria platyphylla*), known to the hunters of the Delta and other parts of Louisiana as wild potato or wild onion, were found to furnish 70 per cent of the food of canvasbacks collected and more than 65 per cent of the food of mallards, and the pintail was also found to feed upon them. This plant is thought to be hardy anywhere in the southern half of the United States, and may be proved to be so farther north. The second duck food considered is the wapato, represented by the 2 species, *S. latifolia* and *S. arifolia*. The former species is found from the Atlantic to the Pacific coast, its range covering practically the whole United States, while the latter is confined to States from Michigan and Kansas westward. In the course of the studies, the Biological Survey has found various parts of *Sagittaria* plants in stomachs of the following species of waterfowl: Mallard, widigeon, green-winged teal, blue-winged teal, spoonbill, pintail, canvasback, little bluebill, ruddy duck, Canada goose, and whooping swan. The remaining 3 duck foods discussed are the chufa (*Cyperus esculentus*), wild millet (*Echinochloa crus-galli*), and banana water lily (*Nymphaea mexicana*). In the discussion of the plants directions are given for their propagation.

Report of entomologist, A. F. CONRADI (*South Carolina Sta. Rpt.* 1913, pp. 20-24).—This report consists mainly of a brief discussion of the progress of two Adams Fund projects, the first, that of the relation of temperature and moisture to insect activity; and the second, that of the slender wireworm of cotton and corn.

In studying the relation of moisture to the hibernation of several species, exact weights were taken daily, commencing at a date previous to hibernation and continuing through the entering and leaving of hibernation. It was found that the weight at hibernation varied from 28 per cent in the squash bug to 32 per cent in the potato beetle, lower than constant weight during activity prior to and after hibernation. The invariable habit of these insects of avoiding places containing a high percentage of moisture leads the author to conclude that their reduction in weight is due to the elimination of moisture preparatory to hibernation. These species are less resistant to low temperature when in a moist environment, no individuals surviving 45 to 52° F., when exposed to ice in an ice box, owing to the saturation of the air, and the same was true in the case of eggs of the squash bug.

Further studies of *Hortistonotus uhleri* show that the larvæ are injurious only on barren upland soils; the larvæ avoid moisture and occur mainly on porous, lean, sandy, upland soils that will not saturate at any time.

Studies were also made of the cotton root louse and *Lasius niger americana*, its principal attendant.

The studies of wireworms have shown *H. uhleri*, *Monocrepidius vespertinus* and *M. lividus*, to be the species concerned, the first mentioned being the cause of nearly all the trouble. The investigations show *H. uhleri* to have an annual life cycle, the adults appearing in June and laying eggs during June, July, and August. It was found that the full-grown insects avoids packed or undisturbed soil in depositing its eggs.

Report on the prevalence of some pests and diseases in the West Indies during 1912. H. A. BALLOU (*West Indian Bul.*, 13 (1913), No. 4, pp. 333-347).—This third report (*E. S. R.*, 28, p. 248) treats briefly of the more important insect pests and plant diseases occurring in the West Indies in 1912.

Entomological pests and problems of southern Nigeria. A. D. PEACOCK (*Bul. Ent. Research*, 4 (1913), No. 3, pp. 191-220, pls. 6, figs. 2).—This relates to insects affecting cotton, cacao, maize, yams, rubber, mahogany, Arabian coffee, etc.

Some American insects and arachnids concerned in the transmission of disease. A. W. MORRILL (*Separate from Ariz. Med. Jour.*, 1914, Jan., pp. 12, figs. 8).—A paper presented before the Arizona Medical Association in May, 1913.

The Philippine locust (*Pachytylus migratoroides*); natural influences affecting its propagation and distribution. D. B. MACKIE (*Philippine Agr. Rev. [English Ed.]*, 6 (1913), No. 11, pp. 538-547, pls. 2).—The natural influences affecting this locust in the Philippines are dealt with under the headings of climate, food supply, and natural enemies, including predators, parasites, and diseases.

The parasitic enemies of the locust include three dipterans and two nematodes, the latter belonging to the genera *Gordius* and *Mermis*. Though reports have been received that whole swarms of locusts have been destroyed by these nematodes in Negros, reliable evidence is said to be lacking. The author's examinations have failed to show more than 7 per cent of the locusts to be parasitized by nematodes. Experimental work with *Cocobacillus acridiorum* obtained from Argentina has given negative results.

On the use of poison in the control of locusts in the Anglo-Egyptian Sudan. H. H. KING (*Cairo Sci. Jour.*, 7 (1913), No. 86, pp. 251-254).—The author briefly reviews the methods of controlling locusts which have been adopted in the Anglo-Egyptian Sudan in the past. He concludes that with ordinary care locusts can be controlled in the Sudan by the use of arsenite of soda and treacle, as has been done in other countries.

The biology of *Cimex boueti*, C. JOYEUX (*Arch. Par.*, 16 (1913), No. 1, pp. 140-146, figs. 8).—This hemipteran is said to occur commonly at various points in the Sudan.

The chinch bug (*Blissus leucopterus*), T. J. HEADLEE and J. W. MCCOLLOCH (*Kansas Sta. Bul.* 191 (1913), pp. 287-353, figs. 19).—This summarized account of the chinch bug is based upon a review of the literature and investigations conducted in Kansas. The subject is taken up under the headings of habits and life history, injury, natural checks, and measures of control.

"The chinch bug winters in bunch grass (*Andropogon scoparius*), big bluestem (*A. furcatus*) false redtop (*Triplasis purpurea*), and various other shelters. With the coming of spring the bugs leave their winter quarters and locate in wheat and other small grains. Here young are produced that reach maturity shortly after harvest time. With the failure of food in the small grain field these bugs migrate, usually on foot, into adjacent fields of corn and sorghum. Here young are produced that reach maturity by fall and establish winter quarters in the grasses. The chinch bug, both as young and as adult, damages its food plants by piercing the rind, sucking the sap, and killing the tissue about the wound. The chinch bug damages Kansas crops many millions of dollars in a single year, and many greatly reduce the wheat and absolutely destroy the corn and sorghums of the individual farmer. The chinch bug thrives in dry seasons and dies in wet ones. Wet weather destroys it directly and indirectly—directly by burying the young and the eggs; indirectly by weakening the bug and rendering it more susceptible of disease, and by encouraging the growth of its terrible fungus parasite (*Sporotrichum globuliferum*).

"The chinch bug has no efficient natural enemies other than certain parasitic fungi, the most active of which is *S. globuliferum*. The parasitic fungi are well distributed throughout that part of the United States subject to chinch bug outbreaks, and cause great epidemics when temperature and moisture become favorable. An average mean temperature of 75° F. and a moisture close to saturation are most favorable to the activity of *S. globuliferum*.

"All the really careful work thus far done on the problem agrees with our own results in showing that it is not possible by artificial distribution of the fungus materially to hasten the progress of the chinch bug disease caused by *S. globuliferum*. The advocacy of the control of the chinch bug by artificial distribution of the fungus has already cost Kansas many millions of dollars in staple crops through engendering the neglect of really efficient measures, and further advocacy of it is opposed to the best interests of Kansas agriculture. All the most careful tests at this station and elsewhere show that twice during the year the chinch bug may be destroyed—while passing from wheat and other small grains into adjacent fields of corn and sorghum, and when just firmly established in winter quarters. Destruction of chinch bugs in winter quarters by use of fire has proven, in our experience, the cheapest and most practicable method of solving the problem."

Burn the chinch bug in winter quarters, G. A. DEAN and J. W. MCCOLLOCH (*Kansas Sta. Circ.* 32, pp. 7, figs. 4).—This circular, emphasizing the importance of destroying the chinch bug in its winter quarters, is based upon the investigations reported in the bulletin noted above.

The grape leafhopper in the Lake Erie Valley, F. JOHNSON (*U. S. Dept. Agr. Bul.* 19 (1914), pp. 47, pls. 3, figs. 13).—This report is based upon studies of *Typhlocyba comae* conducted at North East, Pa., commenced in 1910, and includes frequent references to the literature. Reports of field experiments by the author have been previously noted (*E. S. R.*, 27, p. 758), as have studies by Hartzell of the New York State Station (*E. S. R.*, 27, p. 157).

The report contains a record of life history studies, together with a short historical account of the part this insect has played as an enemy of the grape-vine in other grape-producing sections of the United States and Canada. A detailed account is given of its habits and destructiveness, the kinds of remedies that have been devised for its control, and the nature of the spray equipment and spray material which, in recent experiments, have proved most effective in holding the pest in check.

The life history studies reported show that there is only one full brood of nymphs a year in the region of the Great Lakes. Field experiments prove conclusively that this pest can be controlled by spraying against the nymphs with tobacco extract solution.

"In the vineyards of Ohio, west of Cleveland, and in the vineyards of Michigan another species of grape leafhopper, *T. tricineta*, is the predominant and destructive species. The life history and habits of this species, however, are so nearly identical with those of *T. comes* that the remedial treatment recommended for the latter can also be used with success against the former, namely, the application of the tobacco-extract spray to the nymphs at the time they appear in maximum numbers upon the underside of the grape leaves, which for these States is during the last few days in June or very early in July."

A 4-page bibliography of the more important literature is appended.

Woolly aphid of the apple (*Schizoneura lanigera*), EDITH M. PATCH (*Maine Sta. Bul.* 217 (1913), pp. 173-188, pls. 6).—A further report of studies of this pest (*E. S. R.*, 28, p. 251), based upon observations made in 1913.

While the author has not as yet observed the return of the fall migrants to the elm under outdoor conditions, she has repeatedly during 2 years observed the spring migration from elm to apple and mountain ash and the subsequent development of the summer colonies so that there is no doubt that the species returns to the elm for the deposition of the winter eggs.

"On the elm the stem mother, which hatches from the overwintering eggs sheltered probably in rough crevices of the bark, appears early in the spring and may be found in Maine before the middle of May stationed on the partly opened leaf buds. The beak punctures on the rapidly expanding new leaves cause an unevenness of growth which forms a protection for the aphid. By the last of May the earliest of these wingless stem mothers are mature and found in the deformed elm leaves producing the next generation. . . . These nymphs, like the stem mother, are a wingless form and they become fully developed about June 10. . . . Their progeny are the third generation and attain wings. These winged aphids are known as the spring migrants. It takes 3 weeks or slightly more or less, beginning about June 20 for all the individuals of this third generation to get their growth, so that the migration covers a considerable period. . . . During this time these winged aphids may be found alighting on the leaves of apple, mountain ash, and hawthorn. They creep to the underside of the leaf and remain there while they give birth to their progeny (i. e., the fourth generation). These young, before they feed at all, crawl to the stem of the water shoots, or to some tender place on the bark, often near a pruning wound, and there start the colony on the summer host plant."

"There are apparently three summer generations of progeny of the elm leaf migrants upon the apple in Maine, two apterous generations followed by a generation part of which, the fall migrants, become winged and leave the apple, and part develop into apterous forms and, remaining on the apple, give birth to nymphs which while still young seek protection at the base of the tree for the winter and are known as the hibernating nymphs. It is the function of

the migrants to seek the winter host and there give birth to the true sexes. These are the tiny yellowish brown egg-laying females and the still smaller pale yellow males. Both sexes are wingless and with rudimentary mouth parts which are apparently functionless. . . . Such a cycle with the annual migration to and from the apple with the elm serving as host for the first three spring generations is undoubtedly typical for *lanigera*. The hibernating nymphs which remain protected about the crown of the apple over winter and ascend to tender places on the bark before feeding in the spring give what looks like a 'closed cycle' of apterous viviparous females persisting on the apple. . . .

"The case of the woolly aphid of the apple is still further complicated by the root colonies which although hidden in their operations really are often much more pernicious than the colonies on trunk and branches. These root colonies ordinarily remain underground all the year round, apparently until the roots become too badly demolished for feeding purposes."

The economic status of this species and preventive and remedial measures are discussed and structure and habitat keys given.

Pseudococcus filamentosus in Dar es Salaam, KRÄNZLIN (*Pflanzer*, 9 (1913), No. 10, pp. 493-507, pls. 6).—This mealy bug, also referred to as *Dactylopius perniciosus* (E. S. R., 24, p. 355), is the source of considerable injury in Dar es Salaam, German East Africa, to the valuable shade tree *Pongamia glabra*, lebbek trees (*Albizia lebbek*), cotton, etc.

A new Eriococcus, E. O. ESSIG (*Jour. Ent. and Zool.*, 5 (1913), No. 4, pp. 179-181, figs. 2).—A species collected at Nacon Chico, Sonora, Mexico, on a species of *Cinchona* is described as *Eriococcus cockerelli*.

Pernicious scale.—The present position, C. P. LOUNSBURY (*Agr. Jour. Union So. Africa*, 6 (1913), No. 4, pp. 662-670).—A somewhat detailed account is given of the present distribution of the San José scale in Transvaal, Orange Free State, and Natal.

Contribution to the study of sericulture in Indo-China, BUI-QUANG-CHIÊU (*Bul. Écon Indochine*, n. ser., 16 (1913), Nos. 101, pp. 164-178; 102, pp. 376-401).—This paper deals with the history of sericulture, geographical distribution of the industry, races of silkworms, manner of rearing, diseases, the silk industry, and the mulberry in Indo-China.

Recent studies of the corpuscles found in pebrine of the silkworm, G. MARI (*Bol. Quind. Soc. Agr. Ital.*, 18 (1913), No. 3, pp. 86-92, fig. 1).—A review of recent work relating to *Nosema bombycis*.

The gipsy moth and the brown-tail moth, with suggestions for their control, A. F. BURGESS (*U. S. Dept. Agr. Farmers' Bul.* 564 (1914), pp. 24, figs. 10).—Brief popular accounts of these two pests, including their natural enemies, are followed by more detailed accounts of the approved methods of combating them.

Codling moth studies in 1911.—The driving spray under excessively wormy conditions, E. D. and W. M. BALL (*Utah Sta. Bul.* 129 (1913), pp. 265-300, figs. 2).—The authors' summary and conclusions drawn from the studies here reported are as follows:

"Western orchards, if unsprayed, would average from two to four or more worms per apple except in years of exceptionally heavy crops; therefore, methods and poisons must be able to meet successfully these conditions. The great majority of the first brood worms and over one-half of the second brood ones enter the calyx cups, therefore the most efficient spray will be the one that destroys the greatest percentage of these worms. The second brood of worms in Utah is ten or more times as large as the first; therefore, each first brood worm killed has saved ten worms in the second brood.

"The killing efficiency of a given method or of a given poison can, therefore, be very accurately measured by the calyx efficiency in the first brood. The killing 'efficiency' of a given spray is a much better measure of its value than the percentage of wormy apples in the orchard. The efficiency of a given spray on the first brood can be accurately measured without regard to the number of worms in an orchard or the method of checking, provided there are no more worms than apples.

"The first calyx spray (first spray) is by far the most valuable single spray that can be applied, killing 98 per cent of all worms entering the calyx during the year, and over 99 per cent of those in the first brood. This spray alone will not control seriously infested orchards, but must be combined with other sprays and banding.

"The standard poisons at the usual strengths (lead arsenate 5 lbs.) are not any stronger than are necessary to do efficient work. They cost less than one-half cent per box of apples. It is false economy to cut down the strength of the poisons."

Tests of the relative efficiency of the various sprays showed under extremely wormy conditions an efficiency with 5 lbs. lead arsenate of 100 per cent at the calyx and a total of 90 per cent for the first brood, and of 98 per cent at the calyx for the second brood. The corresponding efficiencies with 2½ lbs. arsenate of lead were 98, 80, and 80 per cent; with 5 lbs. of a proposed new proprietary compound 74, 45, and 46 per cent, and with 2½ lbs. of this compound 53, 74, and 17 per cent.

On the comparative effects of arsenic and lead in compounds employed in combating the *Cochylis*, L. MOREAU and E. VINET (*Compt. Rend. Acad. Sci. [Paris]*, 156 (1913), No. 11, pp. 906-908; *Rev. Vit.*, 39 (1913), No. 1007, pp. 489, 490; *abs. in Internat. Inst. Agr. [Rome]*, Mo. *Bul. Agr. Intel. and Plant Diseases*, 4 (1913), No. 6, p. 967).—Repeated observations by the authors and others^a of the fact that *Cochylis* larvæ which escape destruction from arsenate of lead are small, weakly, yellow, and capable of effecting very little injury, while in neighboring plats treated with other insecticides the surviving larvæ are at the same time normal, well-developed, and as strong as control specimens, led to the investigations here reported. Applications of arsenate of zinc, arsenate of lime, lead acetate, and lead carbonate, as well as arsenate of lead, were made at the time of emergence of the first larvæ and again 8 or 10 days later.

By weighing the larvæ from the sprayed plats it was found that the effect was largely due to arsenic. The mortality was larger where arsenate of lead was employed than with the other arsenical sprays.

Wine traps for the *Cochylis* moths, L. MOREAU and E. VINET (*Compt. Rend. Acad. Sci. [Paris]*, 157 (1913), No. 23, pp. 1158-1160).—The authors conclude that traps of wine are only of value as a supplement to other measures.

The gray larch roller in the Upper Engadine (*Schweiz. Ztschr. Forstw.*, 64 (1913), No. 2, pp. 48-53).—This paper relates to *Steganoptycha pinicolana*.

A galleriine feeding in cacao pods, H. G. DYAR (*Insecutor Inscitiae Menstruus*, 1 (1913), No. 5, p. 59).—*Tineopsis theobromæ* n. g. and n. sp. is said to have been reared from the cacao bean at Pittsburgh, Pa.

The tobacco splitworm, A. C. MORGAN and S. E. CRUMB (*U. S. Dept. Agr. Bul.* 59 (1914), pp. 7).—Experimental rearings of the larvæ of the potato-tuber moth on tobacco, etc., and of the tobacco splitworm on potato tubers, etc., have shown that there is no perceptible difference in the period of development, in habits, or in the behavior of the two forms on a given food plant that could be ascribed to the different origins of the individuals. The known food plants

^a *Rev. Vit.*, 35 (1911), p. 39.

of *Phthorimæa operculella* include *Solanum torvum*, *S. verbascifolium*, *S. carolinense*, *S. nigrum* (?), eggplant, potato, tomato, *Physalis peruviana*, *Physalis* sp., *Physalodes physalodes*, *Datura stramonium*, and tobacco. In 1908 it was the cause of an injury to shade-grown tobacco in Dade County, Fla., to the extent of \$12,000 on 80 acres.

The larva occurs both as a borer and as a leaf miner, the former probably being the original habit, examples of which have been observed in the fruit of eggplants, in tomatoes, and in the stems of tobacco. In Sumatra this is the more common form of injury to tobacco, the larva forming a gall in the stem, and a similar habit of the larva has been observed in the Transvaal.

Only the older tobacco leaves are affected unless the infestation is very severe, and in these, the lower leaves, grayish, irregular blotches are produced, which later turn brown and become fragile, so that the tobacco is unfit for wrappers. In Tennessee the splitworm requires from 25 to 30 days in summer for completing its development from egg to adult. "Of this time 4 days are spent in the egg stage, 15 to 17 days in the larval stage, and 6 to 9 days in the pupal stage. The length of these stages is considerably affected by temperature. . . . Eggs are deposited singly upon the foliage of the host plant. Moths begin to oviposit 2 or 3 days after emergence and continue ovipositing for several nights. The largest number of eggs obtained from a single moth was 46, but this probably does not represent the maximum oviposition under normal conditions. . . . The larva pupates in a slight but somewhat tough cocoon of silk and débris among clods or rubbish at or near the surface of the soil. . . .

"Full-grown larvæ have been received from Florida in late April, indicating that oviposition may begin in that region as early as March. Larvæ have not been found at Clarksville, Tenn., earlier than June 3, and moths have emerged in numbers as late as the middle of November. It seems probable that at least 6 generations are produced in Florida and that about 3 or 4 are produced at Clarksville, Tenn. Moths emerged in 5 cages at Clarksville November 14, 1913, and were still active December 15, upon which date about an equal number of cages still contained pupæ. These records seem to indicate that the winter is passed in both the pupal and adult stages. No larvæ, so far as known, have entered hibernation successfully." It is stated that about 25 per cent of the full-grown larvæ of a large shipment of splitworms that came from North Carolina in August, 1913, were parasitized.

Remedial measures consist of the destruction of the larvæ in the mines by pinching and the destruction of all trash in and around tobacco fields and tobacco barns by burning. In severe infestations it may be necessary to prime off and destroy the leaves infested by the earlier generations.

Coccobacillus parasites of insects, A. PAILLOT (*Compt. Rend. Acad. Sci. [Paris]*, 157 (1913), No. 15, pp. 608-611).—The name *Bacillus gortynæ* is given to an organism isolated from caterpillars of *Gortyna ochracea*, an artichoke pest, during the course of an epidemic among them in the Department of Var, France. Microscopic examination of the blood and tissues of caterpillars of *Pyrameis* (*Vanessa*) *cardui*, which devour the leaves of artichokes, showed the presence of 2 different coccobacilli to which the names *B. pyrameis* I and *B. pyrameis* II are given. The author finds it difficult to determine whether the coccobacilli are distinct or merely varieties of a single species. He suggests that these may represent one or more saprophytic species, widespread in nature, which are readily adaptable to a parasitic life.

Culicoides kiefferi n. sp., a new Indian bloodsucking midge, W. S. PATTON (*Indian Jour. Med. Research*, 1 (1913), No. 2, pp. 336-338, pl. 1).—Cattle are said to be the chief hosts of this hematophagous dipteran.

The life of the fly, J. H. FABRE (*New York, 1913, pp. 477*).—A popular work containing a translation of all the essays on Diptera from the author's *Souvenirs Entomologiques*.

The Syrphidæ of Ohio, C. L. METCALF (*Ohio State Univ. Bul., 17 (1913), No. 31, pp. 123, figs. 255*).—This paper treats of the subject in three parts.

The first (pp. 12–52) consists of a general discussion of the family; general characters of the egg, larva, pupa, and adult; an evolutionary table of larval habits; biological and ecological relations and economic importance of the larvæ; ecological relations and economic importance of the adults; enemies; and practical measures. The second part (pp. 52–74) consists of a key to known larvæ of Syrphidæ; synopses of life history studies of 10 species, several of which have been previously noted (*E. S. R., 29, p. 456*); and a generic review of the literature on the biology of Syrphidæ. The third part (pp. 74–100) consists of a key to the genera of Syrphidæ; list of Ohio species with keys to the species and various genera which have been, or are likely to be, collected in the State; and a bibliography of 23 titles.

Fruit flies of Fiji, J. F. ILLINGWORTH (*Hawaii. Forester and Agr., 10 (1913), No. 12, pp. 366–370*).—Four species of fruit flies of the genus *Dacus* have been reared from fruit in the Fiji Islands, namely, the Fiji fruit fly (*D. passifloriæ*), from granadilla fruits and mangoes; the pineapple fruit fly (*D. xanthrodes*); the South Sea guava fly (*D. psidii*); and the banana fruit fly (*D. curvipennis*).

The occurrence of the warble fly, Hypoderma bovis, in Canada, C. G. HEWITT (*Canad. Ent., 46 (1914), No. 1, pp. 1, 2*).—The author reports records of the occurrence of *H. bovis* which show it to be widely distributed in Canada from the Atlantic to the Pacific.

Flies in relation to disease.—Nonbloodsucking flies, G. S. GRAHAM-SMITH (*Cambridge, England, 1913, pp. XIV+292, pls. 24, figs. 32*).—In the preparation of this book the author has attempted to collect the most important and reliable information available on the subject. In addition to accounts of the anatomy and biology of flies, methods employed in studying them, bacteriology and ways in which bacteria are distributed, and their relation to specific diseases, he discusses the part played by flies in the dispersal of the eggs of parasitic worms, myiasis, diseases, parasites, and enemies of flies, flies breeding in or frequenting human feces, and prevention and control of flies.

A bibliography of 17 pages and author and subject indexes are included.

The conservation of pathogenic bacteria by flies during hibernation, V. BÉRÉSOFF (*Russ. Vrach., No. 26 (1913), pp. 917–921; abs. in Presse Med. [Paris], No. 93 (1913), p. 939*).—Studies were made of 150 flies collected in St. Petersburg hospitals after a hibernation of from 4 to 5 months. After having been washed in a sublimate solution to destroy all micro-organisms on the surface of the body, cultures were made from the digestive tube which showed the presence of *Staphylococcus pyogenes albus*, *S. pyogenes aureus*, *Proteus mirabilis*, *Bacillus coli*, and three additional varieties of *S. pyogenes*. The intraperitoneal injection of a culture of one of the streptococci killed a mouse in 24 hours. In addition to the above mentioned species the author isolated a large number of micrococci and bacilli nonpathogenic for man, and also 5 micro-organisms which did not appear to have been previously described. Thus the investigations show that a large number of pathogenic micro-organisms are conserved alive in the flies during hibernation.

Hydrotaea dentipes, its biology and the destruction by its larvæ of the larvæ of Musca domestica, I. A. PORTCHINSKY (*Trudy Būro Ent. [St. Petersburg.], 9 (1913), No. 5, pp. 30, figs. 23; abs. in Rev. Appl. Ent., 1 (1913), Ser. B, No. 9, pp. 149–152*).—The author here reports studies of *H. dentipes*

and its relation to other species of coprophagous flies. The investigations show the larvæ of *H. dentipes*, which become predaceous upon reaching the third stage, to be very destructive to the larvæ of the house fly and stable fly.

In experiments to determine the relations existing between the larvæ of *H. dentipes* and those of *Polyetes abolineata*, which are the most rapacious of all coprophagous larvæ, it was found that the resistance of the former was usually fierce and persistent, but never successful. The larvæ of *H. dentipes* were never observed to attack each other even when their food was scarce, although such cannibalism is often practiced by larvæ of *Myospila mediatubunda* and *P. abolineata*. *H. dentipes* is very prolific, depositing 170 to 200 eggs which mature at about the same time. The larvæ travel very rapidly, are omnivorous feeders, and will live on all materials which serve as breeding places for the house fly. It is said that *H. dentipes* visits human dwellings. In observations in the district of Tzarskole Selo, the author found no larvæ of the stable fly and but few of the house fly, but the larvæ of *H. dentipes* were always abundant. In his opinion *H. dentipes*, in addition to other parasitic insects, is chiefly instrumental in preventing the multiplication of *Musca domestica* which otherwise would become a great pest.

Observations of the insect fauna of the southern part of the Government of Stavropol (North Caucasus), made during July and August, 1911, are described.

Empusa muscæ as a carrier of bacterial infection from the house fly, R. M. BUCHANAN (*Brit. Med. Jour.*, No. 2760 (1913), pp. 1369-1372, pls. 2, figs. 6).—The author finds that when house flies, parasitized by the fungus *E. muscæ*, are collected on fly paper that they become a center from which the spores of the fungus are showered in numbers sufficient to whiten other flies stuck fast on the paper in close proximity. He reports investigations made with a view to determining whether or not the spores carry with them bacteria from the body of the fly, if infective organisms from the interior of the fly are disseminated in this manner.

Though the manner in which the fungus gains entrance to the body of the fly is not definitely known, it has usually been stated as occurring through the germination of a spore that has become attached to the surface of the insect and the penetration of the resulting hyphal filament through the body wall. Flies examined by the author, however, gave no microscopical evidence in support of this view as to entrance through the abdominal and thoracic walls. The fungus permeates the entire body, even the legs and antennæ, but in doing so it has always presented certain definite characteristics of localization and form, as are described by the author. The majority of the flies presented great numbers of bacteria in the intestines, and among the hyphæ of the abdominal cavity they were widely distributed, spreading toward the abdominal wall. Though the manner in which this fungus persists from year to year is not known, the formation of resting spores would serve to explain this hiatus in the life history of the fungus, but the existence of such bodies has not yet been definitely determined. On the other hand, the author found upon examination of the eggs from a diseased fly that some of the mycelium remained firmly attached to the outer covering or chorion. Thus the deposition of eggs by a fly harboring the fungus renders it extremely likely that the larvæ would in turn become infected.

In order to determine whether the conidia in their outward course carry bacteria from the fly to the surface upon which they are projected, 10 flies were fixed head downward upon nutritive agar in the center of a Petri plate, with the uniform production of a zonal crop of colonies. Detailed examinations of the first five plated showed that the colonies numbered from 70 to 400 and that their distribution was well within the farthest range of the conidia. By the

usual fermentation tests the colonies were proved to be almost entirely representative of groups in the colon family. One fly supplied four types of coliform bacilli, two gave two each, and two one each. The results are representative in some measure of the intestinal flora of the house fly, as found by several investigators, and also representative of bacteria which may be found in the human intestine.

Since *E. muscæ* proves to be a potential means of bacterial dissemination not hitherto recognized, its use as a means of reducing or exterminating the house fly is regarded as an expedient of doubtful value.

In the author's observations the proportion of diseased to apparently sound flies was small. The fungus showed itself almost entirely in *Musca domestica*, only two parasitized flies of the species *Fannia canicularis* being discovered.

A bibliography of 25 titles is included.

On the predaceous habits of Scatophaga: A new enemy of *Musca domestica*, C. G. HEWITT (*Canad. Ent.*, 46 (1914), No. 1, pp. 2, 3).—The author reports observations of the habit of *Scatophaga stercoraria* of feeding upon the house fly, *Calliphora erythrocephala*, *Stomoxys calcitrans*, *Fannia canicularis*, *Pollenia rudis*, and *Orthellia cornicina*. Its preference for muscid flies is said to be noticeable. "After seizing their victims, they wrapped their legs around them and the neck of the victim was then pierced from below by thrusts of the proboscis and sucked for a short time. The body was afterwards turned over and the proboscis inserted between the abdominal segments, in which position the fly continued to feed for a long time. In some cases, for example *P. rudis*, the victim's head was completely broken off."

Little brown ant doing good work in Hawaii, J. F. ILLINGWORTH (*Hawaii. Forester and Agr.*, 10 (1913), No. 12, pp. 370, 371).—The author's investigations indicate that *Pheidole megacephala* is the principal factor holding house flies in check in Fiji and Hawaii, it being estimated that fully 75 per cent of the flies in Hawaii are destroyed. The ants even attack and destroy the full-grown maggots whenever they appear on the surface of the manure.

The flea, H. RUSSELL (*Cambridge, England, 1913*, pp. VII+125, pl. 1, figs. 8).—This is a small popular handbook on the flea, its anatomy, habits, relation to bubonic plague, bibliography, etc.

Root borers and other grubs in West Indian soils, H. A. BALLOU (*Imp. Dept. Agr. West Indies Pamphlet* 73 (1913), pp. 38, pl. 1, figs. 20).—This pamphlet consists of a selection of insect notes, previously noted from another source (*E. S. R.*, 29, p. 858), to which illustrations have been added.

The grass grub pest, A. P. W. THOMAS (*New Zealand Dept. Agr., Indus., and Com. Bul.* 27, n. ser. (1913), pp. 14).—This paper presents an account of the natural history of grass grubs of the genus *Odontria*, recent observations thereon, and methods of prevention.

The acclimation of *Novius cardinalis* in France, P. MARCHAL (*Compt. Rend. Acad. Sci. [Paris]*, 157 (1913), No. 15, pp. 561-564).—The author reports that sendings of this lady beetle from Italy, Portugal, and the United States have resulted in its establishment in the section of France, which has recently become infested by *Icerya purchasi*.

Parallelism in morphological characters and physiological characteristics in scolytid beetles, A. D. HOPKINS (*Proc. Biol. Soc. Wash.*, 26 (1913), pp. 209-211).—This is an abstract of a paper read before the Biological Society of Washington, D. C., November 29, 1913.

Bees: Feeding and feeders, F. A. JACOBSEN (*New Zealand Dept. Agr., Indus., and Com. Bul.* 39, n. ser. (1913), pp. 8, figs. 3).—A brief popular account.

The occurrence of the Australian cattle tick and the brown dog tick in Key West, Florida (Acarina, Ixodoidea), F. C. BISHOPP (*Ent. News*, 24

(1913), No. 8, pp. 366-368).—The Australian cattle tick (*Margaropus annulatus australis*) is reported to have been collected on native cattle at Key West, Fla., in February, 1912. The brown dog tick (*Rhipicephalus sanguineus*) was taken from dogs and a donkey at the same time. The author points out the importance of ridding Key West of this pest, which in addition to transmitting Texas fever attaches itself to a much larger variety of hosts than does our native cattle tick.

Researches on the embryonic development of nematode parasites, A. MARTIN (*Ann. Sci. Nat. Zool.*, 9. ser., 18 (1913), No. 1-2, pp. 151; *abs. in Rev. Gén. Méd. Vét.*, 22 (1913), No. 264, pp. 689-692).—This work reports studies made of the development of eggs of *Ascaris vitulorum*, *A. suis*, *A. canis*, *A. equorum*, *A. lumbricoides*, *Heterakis columbae*, *Trichocephalus depressiusculus*, *Sclerostomum equinum*, and *S. vulgare*. The first part (pp. 5-77) relates to experimental development of the eggs of several species; the second part (pp. 79-128) to a critical study of the factors influencing the development of the eggs; and the third part (pp. 129-146) to the application of experimental results under conditions existing in natural infestation. A bibliography of 49 titles is appended.

Ktenol, A. GRÉGOIRE (*Min. Agr. et Trav. Pub.* [Belgium], *Off. Rural Raps. et Communs.*, No. 7 (1913), p. 52).—A complete analysis is given of this insecticide.

FOODS—HUMAN NUTRITION.

The baking qualities of flour as influenced by certain chemical substances, milling by-products, and germination of the wheat, J. T. WILLARD and C. O. SWANSON (*Kansas Sta. Bul.* 190 (1913), pp. 237-285, figs. 8).—Experimental methods are described at length and data reported in which the influence on bread making of different chemicals and substances in the by-products of milling was studied.

The chemical substances included among others peptones; glyecoll; leucin; aspartic acid; asparagin, ammonium acetate, tartrate, chlorid, and phosphate; sodium phosphate, bicarbonate, and formate; and potassium nitrate. The substances contained in the milling products included cold water extract of bran, filtered and unfiltered, hot water extract of bran, extracts of wheat scourings, flour from germinated wheat, cold water extract from the bran of germinated wheat, boiled extract from bran of germinated wheat, and cold water extract from the shorts of germinated wheat.

In general, the authors note that the addition of these materials caused no marked increase or decrease in the time of the first rise of the dough. In the case of the second rise the results were more pronounced, the period being markedly shortened with most of the substances used. "The sodium and potassium compounds did not affect the result either way, but the heated bran extract and the cold extract from the shorts of germinated wheat showed a distinct lengthening of the period. The boiled bran extract from germinated wheat also showed the same tendency as far as the trial was comparable with the others."

Considering the amount of rise of the dough as a whole, the authors note that "as a class the amino compounds showed a tendency to decrease the maximum volume of the dough, while the ammonium compounds showed no such tendency as a group. Also the bran extracts from sound bran showed no decrease, while the various products from germinated wheat showed a distinct decrease. . . . The amino compounds and ammonium compounds, as well as the various products obtained from sound and modified wheat, decreased the

time of rising in almost all cases. . . . The time for rising may be shortened through two causes: Either the presence of a food which stimulates the activity of the yeast, or a weakening of the gluten so that the same amount of yeast activity will accomplish the same result in a comparatively shorter time. In this latter case we are likely to have less maximum amount of rise in the dough than in the former case where the substance stimulates the yeast activity without affecting the quality of the gluten. An examination of the figures for the time of rising and comparing them with the maximum rise of dough would show that the amino compounds as a class, whether used as pure chemicals or as found in germinated wheat products, affect the gluten in an unfavorable way. On the other hand, substances which furnish food for the bacteria, such as the ammonium compounds and the extracts from sound bran, stimulate yeast activity without injuring the quality of the gluten. This opens up a very interesting and profitable line of investigation in regard to the different ways the gluten may be affected by the various methods of handling and storing wheat, as well as the chemical compounds which are the ultimate cause of the baking qualities of different flours."

The data reported with respect to spring in the oven and loaf volume do not show any concordance and are not uniform enough so that definite conclusions can be drawn from them, though they do not contradict the conclusions noted above.

With respect to the texture of the crumb the amino compounds, with few exceptions, had an unfavorable effect. "The amino compounds present in modified wheat products were the most pronounced in this respect. On the other hand, with a few exceptions, the ammonium compounds as well as the extracts from sound bran had no unfavorable effect on texture. Amino compounds as a class are unfavorable to the baking qualities of the flour. As a group they are more pronounced in their effects than the proteins such as gliadin, glutenin, edestin, or leucosin. It seems safe to conclude that a study of wheat flour along these lines would be more profitable than many of the methods hitherto used."

Tests were also made to ascertain the effects of adding starch, bran, or bran extract to flour in bread making. The addition of starch, it is noted, would act in a way as a diluent, neither increasing or decreasing the amount of gluten and has the same effect as a decrease of the percentage of protein without any change in its quality.

"There was a regular shortening of the total time for rising, being longest for the check loaf and shortest for the loaf where bran extract was used. . . . The presence of starch diminished the total expansion, oven spring, and loaf volume as compared with the check loaf. The texture was not impaired by the presence of starch but was equal to the check loaf. The use of bran diminished in a larger measure the total expansion, oven spring, and loaf volume. This loaf had the least total expansion and loaf volume. The texture was also poorest in this loaf. It is remarkable that the cold extracted bran should differ in so marked a degree from the nonextracted bran. The oven spring, total expansion, and loaf volume were so much larger in every case that the result can not be due to accidents, and the same results were obtained in the second trial. The total expansion, oven spring, and loaf volume were somewhat less with the hot extracted bran than with the cold extracted bran. The effect of the cold bran extract was, in the main, the same as when this substance was tried before. It had the shortest total time for rising, the largest total expansion, oven spring, and loaf volume in this test [and a little better texture].

The authors discuss the data and raise the question as to whether bran mixed with dough without previously wetting acts merely as so much inert matter, and whether or not a better graham bread would be obtained if the bran were mixed with water and allowed to soak for some time before adding it to the flour. See also previous notes (E. S. R., 29, p. 863; 30, p. 164).

Corn meal as a food and ways of using it. C. F. LANGWORTHY and CAROLINE L. HUNT (*U. S. Dept. Agr., Farmers' Bul. 565 (1914), pp. 24*).—The origin and composition of Indian corn are discussed, as well as corn meal, methods of milling it, and its nature and uses, the relation of corn meal to the balanced ration, the combination of corn meal with more highly flavored foods, cookery of corn meal, and similar questions.

A large number of recipes collected from various sources and standardized are given for corn-meal mushes and similar dishes, corn meal and meat dishes, corn-meal bread, corn-meal puffs, griddlecakes, and waffles, corn-meal puddings, and corn-meal cakes. A portion of these have been previously noted (E. S. R., 29, p. 864.)

In preparing the bulletin experimental studies were made of the subjects under consideration, and the recipes were studied by laboratory methods.

It is pointed out that the purpose of the bulletin is not to recommend Indian corn to the exclusion of other cereals, but "to speak of its value as a food and its distinguishing qualities which call for special methods of cooking, and to show how it may be used to secure variety in one of the principal lines of food materials which make up the usual dietary. . . .

"Corn meal compared with other foodstuffs of a similar nature is a low-priced food material, and when used alone or with other equally low-priced foods make economical dishes.

With reference to the use of corn meal ground in different ways, the following statement is made:

"Since the composition of the new-process meal differs from that of the old-process meal in having less fat as well as less water, it is desirable to make allowance for this when using the new meal. In making such simple dishes as hoeecake and corn-meal pone, which originally were prepared from the meal and water alone, a little lard or butter should be added and in other dishes the allowance of fat should be slightly increased."

The importance of maize as human food. O. RAMMSTEDT (*Ztschr. Öffentl. Chem.*, 19 (1913), Nos. 15, pp. 288-294; 16, pp. 305-316; 17, pp. 327-334).—The author reviews the literature of maize and its methods of use in different parts of the world, reports original analyses, and advocates the more extended use of the cereal in Germany and its greater cultivation in the German colonies.

Immense value of rice as a food. L. M. BRIGGS (*Gulf States Farmer*, 7 (1913), No. 12, p. 11).—A popular article containing a few statistics of rice consumption and recipes for rice dishes.

Investigations of the nutritive value of Finnish rye bread. O. VON HELLENS (*Skand. Arch. Physiol.*, 30 (1913), No. 4-6, pp. 253-284).—The author carried on digestion experiments with normal subjects living for from 2 to 3 days on diets of different types of rye and famine breads with butter and tea. The results indicate that the losses through the feces increased in proportion to the amount and coarseness of the cellulose present.

Aguman—a new nutritive meal made from the soy bean. R. KAFEMANN (*Umschau*, 17 (1913), No. 50, pp. 1041-1043).—The preparation here referred to is described as an easily soluble powder of pleasant flavor which may be consumed in water, milk, or other liquids, used as the basis of soup, or made into bread or cake.

Chemistry and mycology of the fruit of *Cicer arietinum*, A. ZLATAROW and S. STOIKOW (*Ztschr. Untersuch. Nahr. u. Genussmtl.*, 26 (1913), No. 5, pp. 242-247; *abs. in Chem. Zentbl.*, 1913, II, No. 18, pp. 1607, 1608).—A progress report of analyses of a common Bulgarian variety of the chickpea, both in the raw state and in the roasted form called "Leblebiji", with special reference to the amount and forms of phosphorus present.

Contribution to the question of judging the meat of tuberculous cattle as regards its use as food, C. TITZE, H. THIERINGER, and E. JAHN (*Arb. K. Gsndhtsamt.*, 45 (1913), No. 3, pp. 364-424, pls. 6).—Recent investigations along the line of this subject are reviewed, and original work is reported, but the authors do not as yet feel justified in making direct practical application of their results.

Herring salts, P. BUTTENBERG (*Mitt. Deut. Seefisch. Ver.*, 29 (1913), No. 3, pp. 74-83; *abs. in Hyg. Rundschau*, 23 (1913), No. 22, p. 1416).—The chemical composition and physical characteristics of different types of salt such as are commonly used in Germany for curing herring are here noted.

Concerning methods of making coffee, O. W. WILLCOX (*Pure Products*, 9 (1913), No. 12, pp. 611-615).—Experimental data are reported and summarized, and tests by E. Aborn are also briefly reported.

According to the conclusions drawn, boiling gave the greatest amount of extract (strong coffee), the solution containing a relatively high amount of caffeine and caffetannic acid. "Steeping gives a lower amount of caffeine than boiling but quite as much caffetannic acid. When operating with coffee of medium granulation, steeping seems to yield the least amount of caffeine than any other method. Filtration gives less extract than boiling or steeping and gives less caffetannin than any other method. Scalding gives results intermediate between filtration and boiling.

"Percolation gives a low extract, but high caffetannic acid and high caffeine. The reason why percolation gives such results is probably because the water in the percolator is never exactly at the boiling point, and it seems from the work of others that actually boiling water is necessary to dissolve some of the soluble matters of the coffee. The caffetannic acid and caffeine, however, being readily soluble in cold water, seem to be dissolved with great facility in the percolation method, especially in view of the fine granulation used in brewing coffee in the percolating method."

According to the author, uniformity of quality in domestic coffee making depends upon accuracy in measuring the proportion of coffee and water and always having the water at exactly the same temperature, "which can always be done by making sure that it is boiling vigorously before the coffee is added," and by regulating the time in which the grounds remain in contact with the water.

Lemon essence, L. WOLFRUM and J. PINNOW (*Ztschr. Untersuch. Nahr. u. Genussmtl.*, 26 (1913), No. 8, pp. 409-422).—A description of analytical methods and a definition of a standard for lemon essence from the state chemical laboratory in Bremen.

Report of the bureau of food and drugs, M. E. JAFFA (*Bien. Rpt. Bd. Health Cal.*, 22 (1911-12), pp. 272-304).—This third biennial report of the director of the state food and drugs laboratory includes a statement of work done with miscellaneous food products, beverages, water, and drugs. A summary of analytical work is appended.

State of Michigan Dairy and Food Department (*Mich. State Dairy and Food Dept. Bul.* 214-15 (1913), pp. 44, pls. 5).—Besides reports of food and drug analyses, dairy inspections, and miscellaneous notes, this bulletin contains a description of the special demonstration train in which the educational

exhibits of the Michigan State Dairy and Food Department and Board of Health were displayed throughout the State.

The proposed changes in the food law, A. JUCKENACK (*Ztschr. Untersuch. Nahr. u. Genussmitl.*, 26 (1913), No. 10, pp. 488-497).—An address delivered at the twelfth general meeting of the Union of German Food Chemists held at Breslau, June, 1913. The officially proposed changes in the present German law regarding food inspection and the punishment of the sale of adulterated or injurious food materials are discussed, and the resolutions adopted in regard to them by various associations of food manufacturers, etc., are quoted and commented on.

The bleached flour decision, R. A. GORTNER (*Biochem. Bul.*, 2 (1913), No. 8, pp. 532-534).—A controversial article.

Supplement to the discussion of foods and medicines of the ancient Egyptians, F. NETOLITZKY (*Ztschr. Untersuch. Nahr. u. Genussmitl.*, 26 (1913), No. 8, pp. 425-427).—This article contains notes on present day Egyptian food customs similar to those believed to have been practiced in antiquity. Several forms of preserved fish are described, which appear to be not unlike the garum of the ancient Romans.

The cost of living (*Philadelphia, 1913*, pp. VI+265).—This volume is a collection of papers delivered before the American Academy of Political and Social Science, the four general topics being wage standards, family standards, public services and control, and concrete measures for reducing cost of living. Among the individual articles may be mentioned the following: Scientific Management in Home Making, by Mrs. F. A. Pattison; Utilization of the Family Income, by Mrs. Martha B. Bruère; Municipal Markets in their Relation to the Cost of Living, by C. C. Miller; Communal Benefits from the Public Control of Terminal Markets, by Mrs. E. Black; Relation of Cold Storage to the Food Supply and the Consumer, by Mary E. Pennington; and The Housekeeper and the Cost of Living, by Martha Van Rensselaer.

Keeping down the cost of living in Germany, G. N. IFFT (*Daily Cons. and Trade Rpts. [U. S.]*, 16 (1913), No. 270, pp. 894, 895).—The high cost of meats has led to the establishment of municipal markets in Nuremburg where without loss to the city prices are about 25 per cent below those of the retailers.

In order to encourage the use of fish in the place of meat, municipal fish markets have also been established. Free lessons in cooking fish have been given both in the continuation schools for girls and in special weekly courses for housewives, and, in connection with the latter, books of fish recipes have been distributed.

The art of bill of fare making, CAROLINE L. HUNT (*Dakota Farmer*, 33 (1913), No. 23, pp. 1125, 1126).—A summary of an address given at the International Dry Farming Congress, Tulsa, Okla., October, 1913. The work of the U. S. Department of Agriculture for women is briefly outlined and planning an adequate menu is discussed. Various foods are classified and a basis of selection suggested, comparing other foods as sources of protein with an egg as a standard.

Recipes and menus for fifty as used in the school of domestic science of the Boston Young Women's Christian Association, FRANCES L. SMITH (*Boston*, 1913, pp. X+246).—Although this compilation of recipes was published primarily for the use of the author's students, she considers it also of practical value to others concerned with the preparation of food for large numbers of persons. As she points out, the amounts indicated are intended for women at light muscular work and, therefore, may need modification for persons of other dietary requirements.

General recipe book for bakers and confectioners, L. A. ROSSWAAG (*Allgemeines Rezept-Buch fuer Bäcker und Conditoren. New York, 1913, vol. 1, 5. ed., enl., pp. 128*).—This handbook, intended evidently for the use of German professional cooks in the United States, includes numerous recipes for cakes, cookies, frostings, and other sweet dishes.

Camp cookery, AVA B. MILAM and RUTH McN. SMITH (*Oreg. Agr. Col. Bul. 76 (1913), pp. 47, fig. 1*).—Camp food supplies, ration lists (including a sustenance table prepared by the Forest Service of the U. S. Department of Agriculture giving the amounts of different articles of food required per day for 1 to 10 men), camp equipment, and similar topics are discussed, and a large number of recipes given for preparing camp dishes, including bread, meats, vegetables, and pastry.

Agricultural publications as aid to the housekeepers—how they may be obtained, CAROLINE L. HUNT (*Gen. Fed. (Women's Clubs) Mag., 11 (1913), No. 15, pp. 15, 16*).—Information is summarized regarding the publications of the U. S. Department of Agriculture of interest to housekeepers.

How to obtain home economics information, HELEN L. JOHNSON (*Gen. Fed. (Women's Clubs) Mag., 11 (1913), No. 15, pp. 14, 15*).—Suggestions are made regarding sources of information, particularly the publications of the U. S. Department of Agriculture and other government departments.

The statistical study of dietaries, K. PEARSON (*Biometrika, 9 (1913), No. 3-4, pp. 530-533*).—A critical study of the recent investigation by Dorothy E. Lindsay into dietary conditions among laboring classes in Glasgow (*E. S. R., 29, p. 464*), special emphasis being laid on the desirability of anthropometric measurements in such work.

Further investigations regarding digestion and resorption under normal and pathological conditions, E. S. LONDON ET AL. (*Hoppe-Seyler's Ztschr. Physiol. Chem., 87 (1913), No. 5-6, pp. 313-370*).—A brief summary of the results of a long series of experiments (*E. S. R., 20, p. 662*) designed to throw light on the different phases of digestion and metabolism. Surgical methods of altering the course of digestion were frequently used.

The influence of butter fat on growth, T. B. OSBORNE and L. B. MENDEL ET AL. (*Jour. Biol. Chem., 16 (1913), No. 3, pp. 423-437, figs. 5*).—In experiments previously noted (*E. S. R., 30, p. 64*) it was found that young rats which for a time grew at a normal rate on a "protein-free milk" diet sooner or later ceased to grow, and, furthermore, that they recovered and resumed their normal rate of growth when a part of the lard in their food was replaced by a corresponding quantity of unsalted butter. The authors' conclusion that butter supplied some substance which exercises a marked influence on growth has been substantiated by additional experiments which are summarized.

In view of the possibility that even an extremely minute quantity of some substance might be responsible for the favorable influence noted, the butter was separated into three parts, namely, the fatty substances, the insoluble solid elements, and the aqueous solution containing lactose, soluble inorganic salts, and other soluble components of the milk. The feeding trials showed that the growth-promoting factor was contained in the fat fraction, so the other fractions were not considered further.

In discussing the experimental data summarized, the authors state that it appears improbable "that glycerids of the fatty acids ordinarily present in foods are responsible for the promotion of the growth observed when butter fat replaces lard in the diet of rats which have ceased to grow. Lecithin and other phosphorus- or nitrogen-containing substances are excluded by the absence of phosphorus and nitrogen from our butter fat; and cholesterol by the

fact that even more of this substance has been obtained from lard than from butter.

"So far as our experience has shown, the addition of butter fat to our natural 'protein-free milk' foods gives them an efficiency quite comparable with that of our milk food in promoting recovery and the completion of growth. The exact chemical differences between the adequate butter fat and the inadequate lard (which determine success and failure respectively in the food mixtures employed) are far from being satisfactorily known. Chemical examination of the butter fat indicates that the effective component is not a phosphatid or any inorganic substance, inasmuch as nitrogen, phosphorus, and ash are lacking in the product employed. It is suggestive to note that in the one case (lard) we are dealing essentially with a fat mixture deposited in storage depots of the animal organism; in the other, the butter fat represents the product of metabolic activity and synthesis on the part of the cells of the mammary gland. What, if anything, this distinction between cellular product and reserve fat may mean physiologically, remains to be investigated.

"The researches which have been devoted in recent years to certain diseases, notably beri-beri, have made it more than probable that there are conditions of nutrition during which certain essential, but, as yet, unknown substances must be supplied in the diet if nutritive disaster is to be avoided. These substances apparently do not belong to the category of the ordinary nutrients, and do not fulfill their physiological mission because of the energy which they supply. Funk [E. S. R., 28, p. 261] has proposed the name vitamin for the type of substance thus represented.

"Without minimizing the importance of the new field of research and the new view points in nutrition which are presented by these recent findings, we may nevertheless hesitate to accept the extreme generalizations which have already been proposed on the basis of the evidence obtained largely from the investigation of pathological conditions. . . . It is still rather early to generalize on the rôle of accessory 'vitamins' when the ideal conditions in respect to the familiar fundamental nutrients and inorganic salts adequate for prolonged maintenance are not completely solved. Speculation is quite justifiable in so far as it directs attention to a new phase that needs to be taken into account.

"Funk has expressed the belief that the substance which promotes growth and must be present in order to avert the cessation of growth, which we have described to occur after a certain period of successful growth on our earlier dietaries, is either identical with, or analogous to, the 'vitamin' which plays the rôle of an antiscorbutic substance. For this we can as yet find no compelling evidence. Certainly the nitrogen-free butter fat, so successful in remedying our growth failures, contains no substance chemically related to the nitrogenous products which have lately been credited with this unique physiological efficiency. . . .

"Butter fat has shown a further interesting nutritive superiority over lard. At certain periods of the year, particularly in summer months, we have frequently failed to secure satisfactory growth on the dietaries which proved adequate during the usual period of 60 to 100 days at other seasons. Occasionally young rats in the stock colony have exhibited a similar 'epidemic' of poor growth at the same season. The failures are, however, not common to rats fed on the milk food; and we have lately observed that the seasonal failure is also averted by the addition of butter fat to the usual 'protein-free milk' food mixtures. Again, another type of nutritive deficiency exemplified in a form of infectious eye disease prevalent in animals inappropriately fed is

speedily alleviated by the introduction of butter fat into the experimental rations.

"The chemical character of the unique 'accessory substance' in butter fat must be investigated in detail and its possible presence elsewhere determined. Experiments are already under way with varying proportions of butter fat in the ration; but we have not thus far determined the necessary allowance. On the other hand, no amount of butter fat will induce growth on certain dietaries in which the proportions and nature of the inorganic salts are inappropriate . . . , or the quantity and character of the protein are inadequate."

In a supplementary note brief reference is made to experiments undertaken to determine the possible efficiency of fats other than butter fat in preventing decline on the protein-free milk food used and promoting growth. Marked differences in fats from different sources have been found. Egg yolk, for example, appears to behave like butter fat, while some other fats have thus far proved no more efficient than lard.

"Such considerations make it evident that the comparative value of the natural fats employed in nutrition must be determined, as well as the individual rôle of the different proteins, carbohydrates, and mineral nutrients."

Metabolism of mineral matters, R. BERG (*Pharm. Zentralhalle*, 54 (1913), No. 47, pp. 1212-1216).—From clinical observations and theoretical considerations, and on the basis of extensive analysis of the mineral content of various food materials (E. S. R., 29, p. 366), the author formulates the principle that a healthful and adequate diet must contain sufficient inorganic bases to neutralize the inorganic acids present in the food or formed during metabolism, and indicates food materials which may be advantageously used to accomplish this result.

Metabolism of fasting infants, A. SCHLOSSMANN and H. MURSCHHAUSER (*Biochem. Ztschr.*, 56 (1913), No. 5-6, pp. 355-415, figs. 12).—Infants accustomed to bottle feeding were given water sweetened with saccharin in the place of their usual food for periods of from 30 to 76 hours, and the effects on body changes, and, in a few cases, on respiration were noted. The data for nitrogen metabolism and acetone and β -oxybutyric acid are given in detail, but no general conclusions were drawn.

Investigations of the presence and distribution of manganese in animal organs, G. BERTRAND and F. MEDIGRECEANU (*Ann. Inst. Pasteur*, 27 (1913), No. 1, pp. 1-11; *abs. in Hyg. Rundschau*, 23 (1913), No. 22, p. 1411).—Small quantities of manganese ($\frac{1}{100}$ to $\frac{1}{10}$ mg. per 100 gm. fresh material) were found in all the organs and secretions of the 15 types of vertebrates examined, except in the whites of birds' eggs. The differences in the proportions of manganese found in different parts of the same animal were greater than in the same organs of different animals. In general, manganese was more abundant in birds than in mammals, and in liver, kidneys, hair, nails, and feathers, than in lung, nerve tissues, milk, and blood.

Investigations of the amount of manganese normally present in the blood, G. BERTRAND and F. MEDIGRECEANU (*Ann. Inst. Pasteur*, 26 (1912), No. 12, pp. 1013-1029; *abs. in Hyg. Rundschau*, 23 (1913), No. 22, pp. 1410, 1411).—In spite of accurate methods, the results of these studies according to the authors do not agree with those of previous investigators, but indicate much smaller quantities of manganese.

In normal human blood, as well as that of various domestic animals and birds, only from $\frac{1}{10}$ to $\frac{1}{20}$ mg. or less of manganese was found per liter. Twice as much was present in the red blood corpuscles as in the plasma.

The influence of manganese on metabolism is to be studied in future work.

Food as body fuel, H. P. ARMSBY (*Pennsylvania Sta. Bul.* 126 (1913), pp. 59-68).—The author discusses the animal as a prime motor, energy transformations in the body, and the origin of animal heat, and briefly summarizes his investigations and the work of others with reference to these questions.

The results presented, he concludes, may be taken "as demonstrating that the animal heat arises exclusively from the combustions in the body, but they have a much broader significance. They show that the transformations of chemical energy into heat and work in the animal body take place according to the same general laws and with the same equivalencies as in our artificial motors and in lifeless matter generally. The great law of the conservation of energy rules in the animal mechanism, whether in man, carnivora, or herbivora, just as in the engine. The body neither manufactures nor destroys energy. All that it gives out it gets from its food and all that is supplied in its food is sooner or later recovered in some form. We are fully justified, therefore, in speaking of the food as body fuel, and in our studies of its utilization we may be confident that any food energy which does not reappear in the form of heat or work has not been lost but has been stored up in the body as the chemical energy of meat, fat, etc., which may later serve to supply food energy to the human body when consumed as food by man."

The influence of nutrition on the gaseous metabolism of cold-blooded animals, B. ELSAS (*Ztschr. Biol.*, 62 (1913), No. 1-2, pp. 1-31; *abs. in Jour. Chem. Soc. [London]*, 104 (1913), No. 612, I, pp. 1126, 1127).—In the experiments here reported the inanition metabolism of laboratory animals (frogs) was first found by means of a modified Regnault-Reiset apparatus. In the later experiments amounts of fat and of protein equivalent to the inanition metabolism were fed and the effects of the respective diets noted.

Feeding fat did not increase the metabolism, but feeding protein raised it from 17 to 40 per cent. In the author's opinion, the work supports Rubner's theory of the specific dynamic action of different foodstuffs.

Note on the relationship between barometric pressure and carbon dioxid excretion in man, J. A. HARRIS (*Biochem. Bul.*, 2 (1913), No. 8, pp. 530, 531).—The formulæ here given were worked out from Higley's data (*E. S. R.*, 29, p. 569) regarding the product moment correlation method as applied to the question of barometric pressure on carbon dioxid excretion.

Chemical notes on ventilation, P. N. EVANS (*Proc. Ind. Acad. Sci.*, 1911, pp. 55-60; *Gesundhs. Ingen.*, 36 (1913), No. 36, pp. 669-671; *abs. in Zentbl. Biochem. u. Biophys.*, 15 (1913), No. 20-21, p. 848).—The author summarizes the results of his experiments as follows:

"It has been shown that under all ordinary conditions of ventilation the products of respiration move upwards; that this upward movement, by which the harmful products are removed from the level of respiration, is assisted by a low room temperature and by dryness of the air of the room; also, that the fresh air has the same density as expired air (saturated with moisture and at body temperature) at 33° C. or 91° F. if the fresh air is saturated with moisture, at 39° C. or 102° F. if perfectly dry, and at temperatures intermediate between these with different degrees of moistness."

An ergograph for the lower extremities, C. TIGERSTEDT (*Skand. Arch. Physiol.*, 39 (1913), No. 4-6, pp. 299-301, figs. 3).—In the apparatus here described the subject, seated on a bicycle saddle adjusted to a suitable position, presses with his foot upon one end of a lever, the other end of which is weighted. The distance which the weighted end rises is recorded by a needle attached at the fulcrum of the lever.

ANIMAL PRODUCTION.

Modern problems of biology, C. S. MINOT (*Philadelphia*, 1913, pp. IX+124, figs. 53).—This is a series of lectures delivered at the University of Jena dealing with the following subjects: The new cell doctrine, cytomorphosis, the doctrine of immortality, the development of death, the determination of sex, and the notion of life.

The general trend of development and inheritance problems, A. GREIL (*Richtlinien des Entwicklungs- und Vererbungsproblems*. Jena, 1912, vols. 1, pp. 352; 2, pp. 364).—These volumes are an enlargement on material previously reported (E. S. R., 27, p. 175).

Some phenomena of species hybridization among pheasants, G. P. MUDGE (*Anat. Anz.*, 45 (1913), No. 8-9, pp. 221-224).—It was observed that the first hybrid generation derived from a Silver female and a Swinhoe male "appears to manifest a translocation of a plumage character not only from the female sex of one of the parental species to the opposite sex of the hybrid, but from one body region of the female of the species to another body region of the opposite sex of the hybrid." It is also suggested that "not only does the male of a species transmit some of the secondary sexual characters of the female of his species, but that the female of a species may transmit those of the male." The same sort of translocation was observed in the second hybrid generation. The F₂ generation reproduced some F₁ hybrid features together with evidence of segregation of unit characters.

With regard to the 2 central retrices there was a transposition of color or pattern from the hen of one species to the cock of the hybrids, from the lateral retrices of the same species to the central retrices of the hybrid, and a reversal of orientation of pattern and of adjacent color areas. In the F₁ generation there was a transposition of the color characteristics of the primaries and secondaries of the Swinhoe hen to the male hybrid. In F₂ there was a complete segregation of one of the Swinhoe cock characters in one of the birds, in another a new character representing a somatic mosaic of the modified pattern of both parental cock species appeared, and in other members a remanifestation of the hybrid polymorphism shown in F₁ generation.

It is stated that conclusions drawn from these observations can only be tentative and provisional, awaiting further investigations along this line.

The establishment of a race of white canaries, MAUD S. MARTIN (*Sci. Amer. Sup.*, 76 (1913), No. 1982, pp. 410, 411).—A pure white hen canary, the sport offspring from ordinary buff parents and very much inbred, was mated with an unrelated buff cock. Three buff cocks and 3 buff hens were reared from this mating. These were then mated, producing 48 buff chicks and 18 white ones. Three buff hens from F₁ were mated to their sons, the white cocks of F₂ producing 14 buff chicks and 26 white ones. The 3 white hens from F₂ were mated to the white cocks F₂, producing 25 white chicks and no buffs, thus proving their recessive character. Six buff hens from F₂ were mated to white cocks of F₂, 2 of them giving only buff birds, presumably dominants; the other 4 having 16 buff and 27 white, evidently hybrids or impure dominants. A race of white canaries has thus been established which breed true to color and obey the Mendelian laws, producing dominants, hybrids, and recessives.

Tables for calculating coefficients of inbreeding, R. PEARL and J. R. MINER (*Maine Sta. Bul.* 218 (1913), pp. 191-202).—This bulletin furnishes tables for the calculation of coefficients of inbreeding, described and explained in a former publication (E. S. R., 30, p. 66).

"These tables make it possible for any farmer or breeder to analyze the pedigree of his stock by the method of inbreeding coefficients without any arithmetical computation on his part beyond the simple addition of a column of figures."

Analyses of fodder plants, grasses, ensilages, etc., J. C. BRUNNICH (*Ann. Rpt. Dept. Agr. and Stock [Queensland], 1912-13, pp. 72, 73*).—Complete analyses are given of the following feeding materials: Ditch millet (*Paspalum scrobiculatum*); cockshin grass (*Panicum crus-galli*); barley grass (*P. decompositum*); *P. divaricatissimum*; *P. flavidum*; *P. foliosum*; brown top (*Pollinia fulva*); scented golden beard (*Chrysopogon parviflorus*); Johnson grass (*Sorghum halepense*); *S. plumosum*; tall oat grass (*Anthistiria avenacea*); kangaroo grass (*A. ciliata*); *Agropyron scabrum*; *Stipa aristiglumis*; bamboo grass (*S. micrantha*); *Deyeuxia forsterii*; white top (*Danthonia pallida*); Rhodes grass (*Chloris gayana*); stink grass (*Eragrostis major*); arrow-root bagasse, silage; wheat, thistles, and wild mustard; pumpkin (cow, crown, and silver); green fodder (cape barley and cowpea); and Indian and seedling cane.

Report of commercial feed stuffs (*Louisiana Stas. Feed Stuffs Rpt. 1912-13, pp. 132*).—This bulletin reports analyses on 12,226 samples of the following feeding stuffs: Cotton-seed meal and feed, rice bran, rice polish, wheat bran, wheat middlings, corn chop, molasses feeds, hominy feeds, brewers' grains, alfalfa meal, blood meal, meat scrap, bone meal, tankage, dried beet pulp, and various mixed and proprietary feeds.

Feeding stuff analyses, edited by H. B. McDONNELL (*Md. Agr. Col. Quart., No. 62 (1913), pp. 11*).—Analyses are reported of the following feeding stuffs: Beef scrap, gluten feed, linseed meal, dried brewers' grains, meat meal, cotton-seed meal, molasses feeds, dried beet pulp, tankage, and various proprietary stock feeds.

Process of raising the nutritive value of brewery grains, and also of treating spent hops, malt dust, dust obtained in cleaning cereals and the like, and obtaining a feed for cattle, M. HAMBURG (*English Patents 29,996, Dec. 30, 1912; 14,808, June 26, 1913; abs. in Jour. Soc. Chem. Indus., 32 (1913), No. 22, p. 1081*).—A report of a patented process in which "ten parts of pressed and washed yeast are heated to from 50 to 60° C., and stirred until a liquid mass is obtained; this is mixed with 90 parts of wet grains, spent hops, malt dust, or the like, and the mixture is pressed and dried at a low temperature. The yeast may also be mixed with the grains, or with the other substances and a suitable quantity of water, before it is heated."

Yeast combination for use as a feed for animals, F. GOTHARD (*English Patent 2,848, Feb. 4, 1913; abs. in Jour. Soc. Chem. Indus., 32 (1913), No. 22, p. 1082*).—A patented process in which "cattle feed is prepared by drying and grinding a mixture of yeast, 50; peat moss, 25; and hop meal, 25 per cent."

Manufacture of a cattle feed, with simultaneous recovery of cellulose, resin, etc., from cellulose-containing materials, J. KÖNIG (*German Patent 265,483, Feb. 15, 1912; abs. in Jour. Soc. Chem. Indus., 32 (1913), No. 22, p. 1063*).—"Wood, especially the wood of conifers, is heated, if necessary under pressure, first with dilute alkalis, chiefly ammonia, and then with dilute mineral acid, or first with acid and then with alkali, as far as possible in stoichiometrical proportions. The residue is subjected to the usual bleaching process, and the spent liquors are evaporated, either separately or together, and with or without addition of other substances suitable for use as cattle feed."

Comparative experiments on the digestibility of rye and wheat and of the ground meal for sheep and swine, F. HONCAMP, P. NEUMANN, and H.

MULLNER (*Landw. Vers. Stat.*, 81 (1913), No. 3-6, pp. 205-288).—Experiments conducted in feeding wheat and rye products to sheep and swine resulted in the following estimated coefficients of digestibility:

Digestibility of wheat and rye products by sheep and swine.

Kind of feed.	Dry matter.		Organic matter.		Protein.		Fat.		Nitrogen-free extract.		Crude fiber.	
	Sheep.	Swine.	Sheep.	Swine.	Sheep.	Swine.	Sheep.	Swine.	Sheep.	Swine.	Sheep.	Swine.
	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>
Wheat sprouts.....			89.3	86.9	93.8	90.1	89.4	85.5	91.1	88.1	.....	41.3
Rye sprouts.....			91.7	83.5	91.8	86.4	90.3	87.8	91.5	90.8	91.4	67.7
Rye coarse meal.....	88.5	90.8	90.3	91.5	78.1	85.2	52.2	47.3	94.5	94.0	11.1	19.7
Wheat coarse meal.....	85.0	89.9	87.0	90.1	84.0	85.6	77.8	72.0	92.6	93.3	.....	33.3
Wheat screenings.....	63.8	70.5	66.8	74.4	75.4	75.5	77.9	92.5	65.5	77.4	60.8	13.7

It is estimated that the rye sprouts contained 21.23 per cent of digestible protein and 75.8 per cent starch; wheat sprouts 21.97 per cent digestible protein and 74.7 per cent starch. The percentage of weed seeds was also estimated and their germinating strength determined.

The general conclusions reached were that rye and wheat sprouts are protein-rich and highly digestible for both sheep and swine; and that the meals of rye and wheat vary in digestibility according to the degree of grinding, the coarser meals invariably being the more digestible.

Digestibility experiments with sheep.—Para rubber seed cake, S. J., M. AULD (*Jour. Agr. Sci. [England]*, 5 (1913), No. 4, pp. 429-433).—The product used in these experiments is the press cake left after expression of the oil from the kernels of the seed of the Para rubber tree. It was thought that the press cake might be dangerous for use as a cattle feed owing to the high content of prussic acid in the seed but the cake was found to be free of this acid. The composition of the cake is given as follows: Moisture 9.27, protein 29.84, ether extract 20.11, nitrogen-free extract 33.08, crude fiber 3.15, and ash 4.55 per cent.

The average coefficients of digestibility of the Para rubber seed cake as determined by several sheep-feeding experiments were as follows: Protein 90.09, ether extract 97.2, nitrogen-free extract 95.3, and crude fiber 100 per cent. These would make it one of the most digestible concentrated feeds available.

Feeding experiments with cattle and sheep, 1902-1913, D. A. GILCHRIST (*County Northumb. Ed. Com. Bul.* 20 (1913), pp. 46).—In this bulletin former experiments (E. S. R., 26, p. 767) are summarized and the experiments for 1911-1913 given in detail.

It is concluded that the results from feeding an equal amount of dry matter in yellow turnips and in swedes to store cattle during the winter months are very similar.

The advantage of box feeding of cattle over stall feeding was found to be considerable. Cattle wintered out of doors showed the best gains at the end of the winter period, but slightly lower gains during the spring and summer periods than those that had been wintered indoors.

Comparing swedes, yellow turnips, and no roots for fattening sheep the results were slightly in favor of swedes. Sheep fed outside made decidedly lower gains than those fed inside. Bullocks made somewhat greater gains than heifers, although heifers fed in box stalls made better gains than the bullocks in stalls. Results indicated practically no advantage from linseed cake

fed to cattle in addition to the normal ration, especially where this is sufficient and well balanced.

Rations for fattening cattle, store cattle, milch cows, and sheep, both including roots and without roots, are suggested.

Feeding experiments (*Mitt. Kaiser Wilhelms Inst. Landw. Bromberg, 6 (1913), No. 1, pp. 29, 30*).—Two lots of 9 steers each were fed 14 weeks on chopped straw, meadow hay, potatoes, rye bran, and cotton-seed meal, each lot receiving a starch value equivalent of 14 kg. per day. Lot 1 received 2.5 kg. of digestible protein, lot 2 1.8 kg. During this period lot 1 made an average daily gain of 0.86 kg. per head, and lot 2 0.83 kg.

Two lots each of fifteen 50 kg. pigs were fed 70 days on steamed potatoes, barley meal, and meat meal, both lots receiving the same starch value equivalent. Lot 1 received a digestible protein allowance ranging from 4.5 kg. to 3 kg. per day; lot 2, 3.5 to 2.5 kg. Lot 1 made an average daily gain of 0.58 kg. per head, lot 2 0.45 kg.

The importance of food accessories as shown by rat-feeding experiments, F. C. COOK (*Abs. in Science, n. ser., 38 (1913), No. 984, p. 675*).—"Most of the 12 white rats fed on a basal diet of protein, fat, carbohydrates, and salts for 80 days lost weight during the last 3 weeks. For 35 days immediately following, 5 cc. of meat extract, plant extract solution, or milk were alternately added to the basal diet, the nitrogen and sodium chlorids being equal. Milk and meat extract stimulated growth, plant extract showed little stimulating power. Eleven young white rats fed for 35 days on the basal diet, plus one of the 3 accessories, showed similar results. Milk, also meat extract, gave the biuret reaction and precipitates with phosphotungstic acid. Plant extract gave neither. Meat extract is a hydrolyzed product practically free from fat and carbohydrates. The rats gained more on a smaller number of calories when milk or meat extract was ingested than when fed on the basal diet alone."

Germany's meat supply, R. P. SKINNER (*Daily Cons. and Trade Rpts. [U. S.], 16 (1913), No. 297, pp. 1388, 1389*).—It is reported that there is a general increase in the cost of meat in Germany, with an accompanying decrease in number of animals slaughtered. The ravages of foot-and-mouth disease account in part for this condition.

Statistics are included giving the wholesale prices of cattle and meat for 1910-1913, the number of domestic animals in Germany, the number of slaughtered animals, and the number of cases of foot-and-mouth disease.

Utilization of entrails of cattle, sheep, and horses in slaughterhouse practice, A. LHOSTE (*Hyg. Viande et Lait, 7 (1913), No. 12, pp. 583-589*).—A description of French methods of cleaning, scouring, desiccating, sulphuring, and further preparation of cattle, sheep, and horse entrails for commercial use.

The cattle of Brazil, L. MISSON (*Vie Agr. et Rurale, 2 (1913), No. 50, pp. 625-633, figs. 6*).—A description of the native breeds of cattle of Brazil, with comments on the comparative value of crossing with the Holstein, Flemish, Limousine, and other European breeds. The Limousine has proved especially valuable in crossing for beef production and dual purpose cattle, while the Flemish and Holstein are apparently best suited for milk.

Organization for the breeding of Swiss spotted cattle, J. KÄPPELI and G. LÜTHY (*Ann. Agr. Suisse, 14 (1913), No. 3, pp. 219-253*).—This includes a history of the Swiss spotted red breed of cattle and comments on herd book organization and membership, distribution, and utility value of this breed, and of the exportations to other countries.

Crossing the cattle of Tunis and the zebu, ROEDERER (*Jour. Agr. Prat., n. ser., 26 (1913), No. 39, pp. 404-406*).—It is stated that the crossing of the zebu

and the cattle of Tunis has been practiced since 1865, with the result that the native has been rendered more resistant to disease, increased in size and weight, and improved in quality of flesh and in working capacity.

Utilization of feed in the zebu, C. PUCCI (*Mod. Zootatro, Parte Sci., No. 2* (1913), pp. 41-50, figs. 2).—Complete digestive trials were made with the zebu and the cattle of Todi, Italy. The digestibility of meadow hay was shown to be dry substance 53.56 per cent, protein 53.03, fat 44.83, nitrogen-free extract 55.86, fiber 57.38, and ash 24.61. The feeding of linseed meal with the hay increased the digestibility.

Plants used for food by sheep on the Mica Mountain summer range, R. K. BEATTIE (*Washington Sta. Bul. 113* (1913), pp. 3-21, pls. 8).—This bulletin reports a study made of the sheep food plants and other range conditions on the Mica Mountain Range of Washington and Idaho.

It was found that "in the region studied, shrubby plants and brush are much more important as sheep feed than are grasses and herbs. The principal feed plant of the yellow pine forest is the buckbrush. Its 2 species are by far the most fattening plants on the range. The principal feed plant of the white pine forest is the huckleberry. Under the conditions observed, the sheep never eat ferns and conifers. Well managed sheep grazing is having no deleterious effect on the reproduction of the forest or of its grazing plants. The presence of the sheepmen in the forest during the fire season is an assistance in fire protection. The leasing system for grazing lands tends to eliminate injurious competition, overgrazing, and grazing feuds, and is by far the most satisfactory method of handling these lands. Well managed sheep grazing, such as is here reported, is a valuable and important factor in the sheep business of the Northwest. Such grazing should be encouraged and extended till every square mile of available summer and winter range is in use and the wool and mutton used in the Northwest is produced in the Northwest."

A bibliography is appended.

[Sheep feeding experiments], C. I. BRAY (*Oklahoma Sta. Rpt. 1913, pp. 33-36*).—In comparing an alfalfa and corn ration with silage and cotton-seed meal for breeding ewes it was found that while somewhat greater gains were made on the former ration, reasonable gains were made on the latter at a considerably lower cost. The lambs dropped by the ewes fed silage were as healthy and strong as from those fed alfalfa and corn.

In an experiment with fattening sheep, silage was compared with alfalfa as a roughage, using the same meal mixture in each case. The gains per head per day of the silage lot were 0.42 lb., of the alfalfa lot 0.545 lb.; the cost per pound of gain 6.6 and 7.5 cts.

Five lots of 4 pigs each were fed the following rations: Corn alone; corn and meat meal, 10:1; corn and cotton-seed meal, 8:1; corn and skim milk, equal parts by weight; and Kafir corn and meat meal, 10:1. The respective gains per head per day were: 0.375, 0.614, 0.71, 1.1, and 0.77 lbs.; the cost per pound of gain 7, 5.5, 4.6, 4.3, and 4.1 cts.; and the return from 1 bu. corn \$0.78, \$1.04, \$1.18, \$1.57, and \$1.25.

A summary is given of the results of wool investigation work for the years 1910-11 and 1912-13. This relates to the average number of fibers per square inch, the average breaking strength, percentage of elasticity, weight of fleece, value of fleece, and percentage of yolk in the Dorset, Merino, Shropshire, Shropshire-Dorset, and Dorset-Merino breeds and cross breeds.

Investigations on the digestibility of Sphagnum moss, peat molasses, etc., S. GOY (*Landw. Vers. Stat., 82* (1913), No. 1-2, pp. 1-92).—Experiments were conducted with sheep to determine the relative digestibility and food value of

turf-molasses feed, both unneutralized and with the acidity of the turf, which is due to the presence of humic acid, neutralized with sodium hydroxid.

It was found that the neutralized feed is as digestible, as palatable, and of better keeping quality than the nonneutralized. In a warm, damp room the nonneutralized feed underwent a chemical and physical change, becoming moldy and taking on a distinct aged smell. This was not the case with the neutralized feed material and under dry, cool conditions it retained its quality indefinitely.

Sphagnum turf was found to be most digestible when fed in small allowances, and the feeding of an increasing quantity of the turf lowered the digestibility of the other materials fed with it. The energy content of the digestible portion of the turf was relatively higher than that of the indigestible portion. Each animal was found to possess an individual degree of digestibility for turf.

A study of the digestibility of the refuse from sulphite-cellulose manufacturing showed that the nutrients of this feed are relatively unavailable and that it decreased the digestibility of other materials fed in conjunction with it.

Caracul sheep, T. R. GARCÍA (*Bol. Min. Agr. [Buenos Aires]*, 14 (1912), No. 10, pp. 1145-1178, figs. 23).—An account of the history, utility value, body characteristics, and introduction into Argentina of this breed of sheep. The adaptability of the caracul sheep to Argentine conditions is pointed out and its exploitation advocated. It is thought that the introduction of this breed will mean a new era in the history of sheep production in that country.

Notes on the camel, B. DANOU (*Bul. Off. Gouv. Gén. Algérie*, No. 23, Sup. (1913), pp. 145-157).—An account of the breeds and types of camels of Algeria, their care and management, and the diseases to which they are subject. The production of camel hair as a commercial product is also discussed.

Hog feeding, G. C. WHEELER, T. R. H. WRIGHT, ET AL. (*Kansas Sta. Bul.* 192 (1913), pp. 355-427, figs. 8).—Summarizing the results of experiments conducted during 1904-1911 to determine the value of corn alone and with various supplements as fattening rations for hogs the following table is given:

Averages of various tests of supplements to corn meal for hogs.

Ration.	Number of hogs.	Average number of days fed.	Average daily gain per hog.	Feed required to make 1 lb. of gain.	Cost of feed required to make 1 lb. gain.
			Pounds.	Pounds.	Cents.
Corn alone in dry lot.....	72	79.88	0.914	6.25	5.94
Corn and alfalfa hay in dry lot.....	59	86.70	1.110	6.27	5.57
Corn and meat meal or tankage in dry lot.....	162	54.00	1.580	4.72	5.27
Corn, shorts, and meat meal or tankage, in dry lot...	144	52.68	1.700	4.58	5.05

It is estimated that with pork at 6 cts. per pound the value returned per bushel for corn in tests where corn alone was fed averaged 53.6 cts.; where corn and alfalfa meal were fed 57.6 cts.; corn and meat meal or tankage 65 cts.; and corn, shorts, and tankage or meat meal 69.8 cts. These experiments indicate the increased value of corn for pork production from the use of highly nitrogenous supplementary feeds.

In an experiment comparing the economy of gains between large and medium type Poland China hogs, the former made the most economical gains, while the latter finished more quickly and carried a finish that would command a higher price on the market. In another experiment it was found that if corn is taken

as the basis of comparison, milo maize, Kafir corn, and sorghum seed each have a higher feeding value when fed with protein supplements, such as shorts and tankage, than when fed with alfalfa hay; that for fattening hogs, milo maize and Kafir corn each have a feeding value slightly lower than corn; and that sorghum seed, while lacking in palatability, has considerable feeding value.

"A comparison of wet and dry mixtures of corn, shorts, and meat meal showed an average daily gain per hog of 1.95 lbs. on the dry ration and 2.31 lbs. on the wet ration."

"An average of 3 lots receiving different brands of condimental stock feed with corn, in comparison with a lot on corn meal, shorts, and meat meal, showed an average daily gain of 0.76 lb. with stock feed rations and 1.69 lbs. daily gain on the corn, shorts, and meat meal ration."

"Hogs fattened on alfalfa and rape pastures made cheaper and more rapid gains than hogs fattened in dry lots. Hogs fattened on rape pasture made gains as cheaply as those fattened on alfalfa pasture. . . .

"When spring shoats were full fed through the summer on alfalfa or rape pasture and finished in the fall in dry lots, those fed a grain ration of corn, shorts, and tankage finished 45 days sooner, averaged 48 lbs. a hog heavier, made gains at a cost of 15 to 20 cts. a hundred pounds less, and sold on the market for from 10 to 20 cts. a hundred pounds more than those fed on corn or corn and alfalfa hay.

"When spring shoats were grown with a limited amount of grain on alfalfa pasture during the summer and finished in dry lots in the fall and early winter, those finished on corn, shorts, and tankage were ready for market 15 days earlier, weighed 55 lbs. a hog more, required 15 cts. less to produce each 100 lbs. of gain, and sold for 20 cts. a hundred pounds more than those finished on corn or corn and hay.

"Spring shoats that were full fed through the summer and thus pushed for an early market, not considering interest and risk, made gains at an average cost of from 15 to 20 cts. a hundred more than similar shoats grown through the summer on pasture and a small amount of grain and finished in the fall and winter in dry lots."

A metabolism experiment with swine, E. B. FORBES (*Abs. in Science, n. ser., 38 (1913), No. 984, pp. 678, 679*).—It is stated that "the usual practical rations for swine contain an excess of acid over basic mineral elements. Urinary ammonia varies directly with this excess of mineral acid, provided the protein intake remains the same. Increased protein intake increases urinary ammonia. This excess of mineral acid in practical swine rations seems not to affect calcium retention.

"Water drinking caused the elimination of sodium and chlorin; abstinence from drinking leads to the retention. The feces may contain an abundance of sodium, but are nearly free from chlorin. Potassium, magnesium, and chlorin balances were usually positive, but were negative during periods of maximum intake, apparently through overresponse in the way of protective elimination of excess ingested.

"Calcium retention was satisfactory only on rations containing meat meal containing considerable bone and skim milk. Neither cereals nor soy beans furnish the calcium requisite for growth. An excess of magnesium to calcium caused loss of calcium with a ration of rice polish and wheat bran. The excess of magnesium to calcium in corn and in other practical rations does not appreciably restrict calcium retention.

"The important deficiencies of corn are, in order of magnitude, first, calcium; second, phosphorus; third, nitrogen.

"Creatin elimination was entirely independent of food, but varied in the same order as live weight, weight of dressed carcass, of flesh, of bones, and of blood.

"Soy beans, meat meal, and skim milk increase the digestibility of the carbohydrates of the corn with which they are fed. Meat meal and skim milk increase the apparent digestibility of the fat, and decrease the apparent digestibility of the crude fiber of the corn with which they are fed, the results being digestion coefficients of more than 100 and less than nothing."

Feeding of lecithin, C. PUCCI (*Atti. R. Acad. Econ. Agr. Georg. Firenze*, 5. ser., 10 (1913), No. 4, pp. 425-451, figs. 3).—Three experiments, in which lecithin was fed in varying quantities to pigs, showed that this phosphorus-containing feed had no influence on increase in weight.

Calcium feeding, J. PAECHTNER (*Wehnschr. Brau.*, 30 (1913), No. 37, pp. 491-494).—It is estimated that in feeding a 700 kg. work horse a ration composed of roughage (3 kg. meadow hay and 4 kg. of chopped straw) and 7.5 kg. corn, 14 gm. of CaO should be added in the form of chalk or commercial preparation. If 8.5 kg. dried potatoes is substituted for the corn, 10 gm. CaO is suggested.

Color inheritance in the horse, E. N. WENTWORTH (*Ztschr. Induktive Abstam. u. Vererbungslehre*, 11 (1913), No. 1-2, pp. 10-17).—The author states that there has been a tendency among investigators to arrange all colors as an epistatic and hypostatic series, expecting them, then, to conform to the simple laws of presence and absence. He attempts to show the fallacy of this.

A microscopic examination and simple chemical tests reveal only 2 pigments in the coat of the ordinary horse, these corresponding to the red or yellow and the black pigments found in rodents. The various factors influencing color are discussed and the different colors qualitatively grouped. The tentative composition as regards the different factors is given for the different colors.

There is appended a short bibliography of works on this subject.

[Trotting horses of Russia] (*Horse Rev.*, 48 (1913), No. 24, pp. 1488, 1489, figs. 9).—The trotting horses of Russia are of 2 classes; the pure-bred Orloffs, a breed established 2 centuries ago, and the "metis" or mixed-bred ones, which have been produced by mingling the native Orloff blood with that of foreign strains, almost exclusively American. While the "metis" horses are as a rule distinctly superior to the pure Orloffs, the latter are in popular favor.

[Poultry breeding], G. WIENINGER (*Monatsh. Landw.*, 6 (1913), No. 11, pp. 339-344).—In poultry-breeding trials to determine the relative value of eggs of different weights it was found that the shell comprised 13.4 per cent of eggs weighing 40 gm., and 10.1 per cent of eggs weighing 70 gm. The respective protein contents were 12.29 and 12.76 per cent; the fat contents 10.13 and 10.51 per cent; the phosphoric acid 0.433 and 0.449 per cent; and the lime 4.85 and 5.03 per cent.

[Cotton-seed meal v. beef scrap for chicks], H. J. WHEELER (*Rhode Island Sta. Rpt.* 1912, pp. 202, 203).—In this experiment 4-weeks-old chicks were fed for 15 weeks on the same amount of a uniform basal ration, protein being added in the form of cotton-seed meal or beef scraps. The results indicated that very little difference exists in the value of the protein in the 2 concentrates, either in the weight of the chicks or in the nitrogen recovered in the cooked portion. It is noted that as a rule, chicks will, if allowed, consume more beef scraps than cotton-seed meal, and in consequence make a larger growth.

Poultry on the farm, L. L. JONES (*Bul. Ga. State Col. Agr.*, 2 (1913), No. 2, pp. 13-44, figs. 10).—This bulletin treats in a popular way of poultry house

construction; feed, care, and management of poultry on the farm; hatching and rearing chickens; and other related subjects.

Unique method of hatching eggs, C. F. BRISSEL (*Daily Cons. and Trade Rpts.* [U. S.], 16 (1913), No. 295, p. 1355).—A brief sketch of the Chinese incubator method of hatching eggs, which consists in covering alternate layers of eggs with rice and heating once in 24 hours, the eggs being taken out at such times.

The international poultry book, G. WOODWARD (*Ballarat, Australia*, [1913], pp. 282, pl. 1, figs. 40).—This book treats in detail of the breed characteristics and fancy points involved in the various standard breeds of poultry, ducks, and geese. There are included short discussions on various problems of breeding, feeding, care, and management of poultry.

DAIRY FARMING—DAIRYING.

Holstein-Friesian color markings, M. H. GARDNER (*Hoard's Dairyman*, 46 (1914), No. 23, pp. 690, 691).—The author explains the color marking requirements of the Holstein-Friesian Association in detail. The occasional birth of a red and white animal from pure-bred stock is explained as a reversion in color markings to some more or less remote red and white ancestor.

Registration rules for cows in Denmark, J. J. DUNNE (*Hoard's Dairyman*, 46 (1914), No. 23, p. 684, fig. 1).—The average measurements of animals accepted for registration in the Funen Herd Book, Denmark, are as follows: Height approximately 50½ in., depth of chest 27½, circumference of chest 84½, length of body 56½, width of hip bones 21½, and width of hip joints 18½ in.

Brown Swiss registry of production reports, F. FREEMYER (*Hoard's Dairyman*, 46 (1914), No. 24, p. 735).—It is reported that of the 94 cows and heifers accepted for registry, 1 cow has a record of 19,460.6 lbs., 3 cows have records above 16,000, 7 above 15,000, 22 above 12,000, and 53 above 10,000 lbs. of milk; and 1 cow has produced 708.16, 4 cows above 600, 21 above 500, and 51 above 400 lbs. of milk fat.

[Champion Ayrshire cow], V. E. FULLER (*Pract. Dairyman*, 6 (1913), No. 24, pp. 1178, 1179, 1183, 1185, 1189, 1190, fig. 1).—An account of the history, management, and feeding of the world's champion Ayrshire cow, Auchenbrain Brown Kate IV, whose record is 23,022 lbs. of milk and 1,078 lbs. of 85 per cent butter.

Tests of the performance of goats belonging to the goat-breeding associations of Brügggen, Harsum, Schüttorf, and Wessenstedt, Hanover, VIETH (*Ztschr. Ziegenzucht*, 1913, Nos. 9, pp. 130-133; 10, pp. 149-151; 13, pp. 200-203; 14, pp. 213-217; abs. in *Internat. Inst. Agr.* [Rome], *Mo. Bul. Agr. Intel. and Plant Diseases*, 4 (1913), No. 9, pp. 1394-1396).—In these tests the Harz breed of goats showed higher yields than the Saane breed. The average milk yield of goats milked 3 times a day was morning 3.2, noon 1.82, evening 2.16 lbs.; and the average fat content 3.22, 4.28, and 3.64 per cent, respectively. Little difference was found between the milk yield of younger and older goats. The tests showed that the capacity of goats for milk production is an individual property and that there is no determined relation between the amount of milk produced and its fat content.

Studies in milk records: On the accuracy of estimating a cow's milking capability by her first lactation yield, W. GAVIN (*Jour. Agr. Sci. [England]*, 5 (1913), No. 4, pp. 370-390, figs. 5).—The results of these studies were based upon the records of 336 cows which have had 5 or more calves. The "revised maximum" (the highest figure common to the 3 highest day yields of a lactation) was used as a measure of yield.

It was found that "the first lactation shows greater variability than the second, third, fourth, or fifth. The estimation of one lactation from another can not be made with great accuracy, since the correlation coefficient between even successive lactations does not rise above $+0.6$. . . With cows giving a fairly high or fairly low first lactation revised maximum, this figure should be used to determine whether they shall be kept or not; but with cows giving a medium first lactation revised maximum, of 10 to 11 quarts, it is worth waiting to obtain the increased accuracy of an estimate based on the mean of first and second lactation revised maximum."

Tables are given for estimating maximum lactation from both the first lactation and the mean of the first and second.

Trial of milking machine, A. CUGNINI (*Indus. Lait. e Zootec.*, 11 (1913), Nos. 8, pp. 115, 116; 9, p. 132; 10, pp. 152, 153, figs. 3; 11, pp. 168, 169; 12, p. 185; 13-14, pp. 200-203).—The principal conclusions drawn from trials with a milking machine were that machine milking, supplemented by hand stripping, had no appreciable depressing influence on either the quantity or quality of the milk. It was slower than hand milking, the expenses incurred were no lower, and to preserve hygienic conditions scrupulous cleanliness in the apparatus was necessary.

Relation of condition of feed to milk production and hygienic value of milk, J. E. LUCAS (*Indus. Lait. [Paris]*, 38 (1913), No. 47, pp. 753-761).—This reports experiments in which sugar beets in different stages of fermentation and of preparation were fed to milch cows to determine their feeding value and also the effect on the development of micro-organisms.

It is concluded from these experiments that the form in which the beets are fed has but little influence on the hygienic value of the milk, that the feeding of dried beet pulp has no advantage in milk-fat production over that fed wet or damp, and that the feeding of whole beets shows only a slight advantage over chopped beets.

Oats and flavor of milk (*Amer. Cult.*, 76 (1914), No. 2, p. 4).—Results from experiments by the Dairy Division of the U. S. Department of Agriculture with 6 cows, 3 fed a grain ration of corn meal, bran, and cotton-seed meal, and 3 fed oats and cotton-seed meal 5:1 are cited, which indicated that contrary to common opinion crushed oats in no way improves the flavor of the milk.

Relation between the bacterial flora of milk and of pasture, A. WOLFF (*Centbl. Bakt.*, [etc.], 2. Abt., 39 (1913), No. 15-17, pp. 411-419).—In studying the influence of the food material on the fungi and bacterial flora of milk, it was found that *Bacterium coli*, *B. aërogenes*, *Micrococcus pallidus*, and *Sarcina liquefaciens* were common to cultures of both the milk and of the pasture crop. In one test *Bacillus mycoides* and *Bacterium erythrogenes* were common to both cultures, while in other cases they were found in but one of the cultures.

The influence of soil on the curdling of milk (*Milchw. Zentbl.*, 42 (1913), No. 17, p. 542).—The investigations showed that there was a variation in the readiness of the forming of curd in different sections, both as to the time required and in the consistency of the curd. This is explained as being due to the type of soil. Milk produced by cows pastured on swampy soil gave a greater amount of curd and the curdling was slower; that from a heavy clay soil resulted in a medium curd with slow coagulation. Pasturing on a porous loam resulted in a medium curd, especially if the loam was moist and had a gravel subsoil, and where dry the curd was tough. Milk produced on limy soil required little rennet and resulted in tough curd.

Effect of foot-and-mouth disease upon composition of milk, J. HONIGMUND (*Molk. Ztg. Berlin*, 23 (1913), No. 52, pp. 619, 620).—In these studies it was found that no change occurred in the specific gravity or the quantity of

dry substance, while the protein content underwent but slight change. The fat and ash contents of the milk were increased, and the sugar content was lower.

Tuberculosis and milk, R. VON OSTERTAG (*Ztschr. Fleisch u. Milchhyg.*, 24 (1913), Nos. 3, pp. 49-53; 4, pp. 75-80; 5, pp. 99-104; 6, pp. 122-129).—This is a general résumé of investigations relating to tuberculosis and milk, and includes a bibliography of 80 references on this subject.

On the possibility of increasing the fat content of milk, GRUMME (*Ztschr. Expt. Path. u. Ther.*, 14 (1913), No. 3, pp. 549-554).—In three 4-day experiments in which goats were fed malt-tropon, in addition to the ordinary feed, there resulted an average increase in milk yield of 18 per cent, in fat content of about 32 per cent, and in yield of butter of about 55 per cent.

The fuel value of milk in relation to its price and its nutritive value, G. FASCETTI (*Indus. Latt. e Zootec.*, 11 (1913), No. 12, pp. 183, 184).—The author believes that the fuel value of milk is proportional to its nutritive value and should be taken as the basis for its trade value. He suggests simple formulas for calculating the fuel value from determinations of the specific gravity and fat content.

Variations in storeroom and fresh milk, S. GUERRERA (*Mod. Zootatro, Parte Sci.*, No. 11 (1913), pp. 455-460).—It is noted that the *Bacillus coli* group develop in from 18 to 20 hours, staphylococci in 46 to 50, racidiform bacteria in 40 to 50, *B. lactis* in 14 to 16, and a general mixture of bacilli in from 30 to 36 hours.

It is concluded that the keeping of milk depends largely upon the type or variety of bacilli present in the milk.

Report of the dairy and cold storage commissioner, J. A. RUDDICK ET AL. (*Rpt. Dairy and Cold Storage Comr. Canada, 1913*, pp. 1-7, 50, 51, 94-123, 128-133).—Although a large increase in the total quantity of milk produced in Canada, and a very noticeable development in some parts of the prairie Provinces, is reported, there has been a material increase in the butter imports during the past few years, mainly from New Zealand.

Reports of cow testing associations and of dairy record centers are given, showing the progress made and the increases in yields as the results of these associations. Statistics are also given on prices, and the exports and imports of cheese and butter from different countries.

The progress of dairying in Canada, J. A. RUDDICK (*Separate from Rpt. Select Standing Com. Agr. and Colon. [Canada], 1912-13, App. 5, pp. 117-131*).—A material decrease in butter and cheese exports from Canada to Great Britain is reported, although the annual production of creamery butter in Canada has doubled since 1900. The annual imports of butter from the United States to Canada are given as 1,468,562 lbs., mostly into British Columbia from Oregon, Washington, and California. A decrease in cheese production is attributed to an increased city milk consumption and the development of the condensed milk industry.

The progress of the Irish dairying industry, A. P. WILSON (*Dept. Agr. and Tech. Instr. Ireland Jour.*, 13 (1913), No. 4, pp. 677-697).—In this paper the author outlines the improvements made in educational facilities, gives statistics relating to the output of dairy products, and presents data on the cost of manufacturing butter and prices received.

Chinese imports of dairy products, G. E. ANDERSON (*Daily Cons. and Trade Rpts. [U. S.]*, 17 (1914), No. 5, p. 76).—It is stated that while American butter was formerly sold in considerable quantities along the China coast it has been supplanted by the cheaper Australian product, which now constitutes about two-thirds of the imports of high-grade goods. Cheese is the only dairy prod-

uct of the United States that is competing successfully with dairy products of other countries in these markets. The use of oleomargarine and other artificial butters is increasing, but the United States has no part in the trade.

A study on milk and cheeses in Greece, with regard to their chemical composition, P. G. PALIATSEAS (*Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases*, 4 (1913), No. 9, pp. 1335-1341).—The principal sources of milk supply in Greece are sheep and goats. It is reported that the sheep on the island of Scopello drop 2 and often 4 lambs. The milk yield often reaches 2 to 5 pts. per day, especially the first 3 months after lambing.

There are about 3,000,000 goats in Greece. The indigenous mountain breed gives but little milk, while Maltese goats give from 3 to 5 pts. per day.

Analyses of milk from sheep and goats are reported, and summarized as follows:

Average chemical composition of sheep and goat milk.

Source of milk.	Specific gravity.	Total solids.	Protein.	Fat.	Sugar.	Ash.
		<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
Flock of 400 Vlachica ewes.....	1.0358	18.45	6.24	7.11	4.19	0.92
Herd of 300 mountain goats.....	1.0305	15.22	4.20	6.11	4.12	0.80
Maltese goats.....	1.0303	13.79	3.80	4.91	4.27	0.81

The cheeses of Greece are of 2 classes, hard and soft, and made from ewe's and goat's milk. Analyses of the principal cheeses are reported.

Gouda cheese, W. D. KOOPER (*Molk. Ztg. [Hildesheim]*, 27 (1913), No. 92, pp. 1783, 1784).—Analyses of 57 samples of cheese made from milk ranging from 2.51 to 4.22 per cent in fat content showed that while in general the fat content of cheese increases with a corresponding increase in that of the milk, this is not always the case. There was a similar increase in the fat content of the whey.

It was found in general, other factors being equal, that cheese from evening milk is richer than that from morning milk. Breed and the age of the cow had no influence on the fat content of the cheese.

Export of Italian cheese (*Indus. Latt. e Zootec.*, 11 (1913), No. 22, pp. 339, 340).—It is shown that the largest exports of Italian cheese are being made to the United States, Austria-Hungary, Argentina, and Great Britain. Statistics of exports for 1911-1913 are included.

Soft cheese making, MISS G. NEST-DAVIES (*New Zeal. Dept. Agr., Indus., and Com. Bul.* 29, n. ser. (1913), pp. 18, figs. 6).—This includes directions for the making of the cream, Gervais, Welch, Wensleydale, Coulommier, and club varieties of soft cheeses.

Report of the department of dairy husbandry, O. F. HUNZIKER (*Indiana Sta. Rpt.* 1913, pp. 38-44).—In a preliminary comparison of the efficiency of different methods of pasteurizing gathered cream for butter making, it is concluded that "flash pasteurization at 170 to 180° F. had the greatest germ-killing efficiency of any process tried in our experiments. During the winter months more resistant micro-organisms are present and higher temperatures are necessary for effective pasteurization than during the summer months. Yeast and molds, owing to their great resistance to heat, cold, and brine may be important factors in the deterioration of butter in storage. They are not destroyed by ordinary pasteurizing temperatures. Cream contains enzymes which may be a factor in the deterioration of storage butter. Most of these are rendered inactive but not all of them are destroyed by pasteurization at

165 to 175°. The olein is a highly unstable fat, susceptible especially to the action of heat and acid. Its oxidation spoils the flavor and keeping quality of butter. Early summer cream contains excessive olein, and unless reasonably sweet should not be pasteurized at high temperature. Butter from pasteurized cream contains less curd and the curd is in less soluble form than that from raw cream. Pasteurization of sour cream at high temperatures causes excessive loss of fat in the buttermilk, the fat being locked up in the curd content of the buttermilk. Other conditions being the same, pasteurized cream butter contains less moisture than raw cream butter; experimental results show an average difference of 1.5 to 2 per cent."

In determining the effect on the clearness and accuracy of the Babcock test of milk of the addition of corrosive sublimate, formaldehyde, potassium bichromate, and sodium salicylate in different amounts and held for 12, 7, and 14 days at 50 and 90°, it was found that "none of the samples containing preservatives varied in percentage of fat from those to which no preservatives had been added." Samples drawn immediately after calving and containing colostrum milk as well as milk immediately prior to drying up showed no appreciable difference in the accuracy of the test and the clearness of the fat. Where glymol was used the results were uniformly 0.2 per cent too low, indicating that in the reading of the test it is necessary to include the meniscus, in order to compensate for the residual fat lost in the bulb of the bottle.

Experiments showed no difference in the results obtained between the 10 per cent and 8 per cent milk test bottles. It was found that the time required for a test may be shortened somewhat by adding the first water before whirling without interfering in any way with the clearness and accuracy of the test.

An effort was made to utilize buttermilk by the manufacture of buttermilk powder. In this experiment 100 lbs. of buttermilk yielded about 9 lbs. buttermilk powder. The powder had a clean acid taste and was much relished. When fed to chickens it was eagerly consumed and produced satisfactory gains in weight. It was best diluted with about 10 parts by weight of water and mixed with the grain feed into a mush. However, it was found that the cost of manufacturing was somewhat out of proportion to the value of the product.

A method for determining the solids in evaporated milk is noted on page 509.

A preliminary comparison of bran and oats for milk production indicates that these feeds are of nearly the same efficiency when fed in a ration containing equal parts of bran or oats and corn meal, corn silage, and clover hay. Each pound of butter fat that was produced by the cows receiving the ration containing the bran cost 20.64 cts., while that from the cows receiving the oats cost 21.77 cts.

Licenses for creameries and testers, laws, rules, and regulations, O. F. HUNZIKER (*Indiana Sta. Circ. 41 (1913), pp. 16, fig. 1*).—This circular gives a text of the 1913 laws of Indiana, referring to the licensing of creameries and testers, together with the rules and regulations concerning the enforcement of these laws by the station, and information pertaining thereto.

VETERINARY MEDICINE.

Annual report of the veterinary pathological laboratory, Nairobi, R. E. MONTGOMERY (*Dept. Agr. Brit. East Africa Ann. Rpt., 1911-12, pp. 33-58*).—This, the author's third report, includes a discussion of work on diseases of cattle, equines, sheep, pigs, dogs, poultry, and game during the year ended March 31, 1912.

Annual report of the civil veterinary department, Bihar and Orissa, for the year 1912-13, D. QUINLAN (*Ann. Rpt. Civ. Vet. Dept. Bihar and Orissa,*

1912-13, pp. 9+VIII+6).—This, the usual annual report, deals with veterinary instruction, treatment of disease, preventive inoculation, breeding operations, etc.

Observations in regard to the feeding value and other properties of some plants in the Government of Viatka, M. PAKOW (*Trudy Būro Prikl. Bot. (Bul. Angew. Bot.)*, 4 (1911), No. 11, pp. 552-562).—A statement in regard to the value of certain plants as a feed for animals, especially from the standpoint of toxicity.

Analyses of some Wyoming larkspurs, I. F. W. HEYL, F. E. HEPNER, and S. K. LOY (*Jour. Amer. Chem. Soc.*, 35 (1913), No. 7, pp. 889-885).—In this paper are given the results of proximate analyses of the leaves, pods, and roots of *Delphinium geyeri*, *D. glaucum*, and *D. nelsonii*. The roots of the latter have previously been found to contain a crystallizable alkaloid melting at 184 to 185° C. and to which the formula $C_{23}H_{33}NO_7$ had been assigned.

As the result of an examination of the leaves, which have been subjected to a most complete proximate analysis, it would seem that the leaves of *D. geyeri* are the most toxic of the 3 species because of their high crude alkaloid content. This alkaloid will, however, be studied further in order to note whether the alkaloids from the different larkspurs behave alike pharmacodynamically. "In order to gain some idea as to the toxicity of the crude alkaloidal mixture obtained from the leaves of *D. geyeri*, an intraperitoneal injection of 0.0564 gm. of the alkaloid as sulphate was made upon a guinea pig weighing 675 gm. Death followed in 9 minutes. In another experiment an intraperitoneal injection of 0.02 gm. as sulphate killed a guinea pig weighing 623 gm. in 35 minutes."

As *D. geyeri* is the most abundant species in Wyoming, it will be subjected to a complete chemical examination of all its constituents.

An analysis of the ash of the leaves of *D. geyeri* is included.

Poisoning of two cattle by tobacco juice, G. GIOVANELLI (*Schweiz. Arch. Tierheilk.*, 55 (1913), No. 4, pp. 178-182; *abs. in Vet. Rec.*, 26 (1913), No. 1328, p. 387).—The author reports observations in which cattle washed with a solution of tobacco juice to destroy lice were affected and the death of two heifers resulted.

Concerning sarcosporidin, L. COMINOTTI (*Centbl. Bakt. [etc.]*, 1. Abt., Orig., 69 (1913), No. 4, pp. 264-271).—The author finds that the sheep sarcosporid (*Sarcocystis tenella*) contains a substance (sarcosporidin) which exerts a toxic action upon rabbits and sparrows characterized by paralytic symptoms. The minimum lethal dose of the dry substance for the rabbit is 0.0001 gm. It is possible in guinea pigs that are resistant to the toxic action of the sarcosporidin to produce anaphylactic shock through repeated injections, as well as to immunize actively rabbits through the injection of increased doses of the sarcosporid dry substance. An immune serum may be obtained from the goat through the administration of a series of intravenous injections of the dry substance, but the action of this immune serum is of short duration.

References to the literature are appended.

Researches on the Sarcosporidia, A. ALEXEIEFF (*Arch. Zool. Exptl.*, 51 (1913), No. 5, pp. 521-569, pls. 3; *abs. in Bul. Inst. Pasteur*, 11 (1913), No. 18, pp. 786, 787).—This first part relates to the morphology of sarcosporids.

A consideration of the infective granule in the life history of protist organisms, H. HENRY (*Jour. Path. and Bact.*, 18 (1913), No. 2, pp. 250-258).—This discussion includes a general review of the literature on the subject, a list of 27 references being appended.

Investigations of the protozoa occurring in ruminants' stomachs, R. BRAUNE (*Arch. Protistenk.*, 32 (1913), No. 1, pp. 111-170, pls. 4).—The protozoa considered include two species of Lobosa (Amœbidæ), five species of Flagellata

of which three are described as new, and five species of Ciliata. A bibliography of 69 titles is appended.

A note on the transmission of spirochetes, J. L. TODD (*Proc. Soc. Expt. Biol. and Med.*, 10 (1913), No. 4, pp. 134, 135).—The author finds that the coxal fluid of *Ornithodoros moubata* infected with *Spirochæta duttoni*, even when free from anal excretion, contains spirochetes.

About the isolated active substances of the hypophysis, H. FÜHNER (*Deut. Med. Wchnschr.*, 39 (1913), No. 11, pp. 491-493, pl. 1).—From the pituitary body a pure crystalline material (composed of 4 substances) was isolated, which is capable of reducing and increasing the blood pressure and stimulating the contraction of the uterus. The name "Hypophysin" has been given to the substance which has all the properties of pituitary body extracts.

Deviation of complement with melitensis and paramelitensis, L. NÈGRE and M. RAYNAUD (*Compt. Rend. Soc. Biol. [Paris]*, 74 (1913), No. 20, pp. 1175, 1176).—While the serum of an animal immunized against *Micrococcus melitensis* will deviate with a paramelitensis antigen, it will deviate to a greater extent with the homologous antigen. On the other hand the paramelitensis serum deviates the same amount of complement with melitensis antigen as it does with paramelitensis antigen, consequently the complement fixation test can not be relied upon as a method for diagnosing Malta fever.

Specific therapy of contagious vaginal catarrh with local immunizing substances, K. v. SANDE (*Berlin. Tierärztl. Wchnschr.*, 29 (1913), No. 20, pp. 365, 366).—A description of colpitol, or an immunizing substance prepared from the streptococcus causing colpitis granulosa, and claimed to have given satisfactory results (*E. S. R.*, 27, p. 886).

The present status of foot-and-mouth disease in Germany, O. KNISPEN (*Mitt. Deut. Landw. Gesell.*, 28 (1913), No. 52, pp. 699-701).—This discussion includes a table which shows the occurrence of foot-and-mouth disease in the 29 Provinces of Germany and in other European countries during the first 11 months of 1913.

Immunization tests with glanders vaccine, J. R. MOHLER and A. EICHORN (*Amer. Jour. Vet. Med.*, 8 (1913), No. 12, pp. 641-649; *Amer. Vet. Rev.*, 44 (1913), No. 1, pp. 31-46).—This investigation was made with guinea pigs and horses and a vaccine prepared by the New York City Board of Health laboratory which consists of a suspension containing 2 mg. of dried glanders bacilli to the centimeter. The horses, 17 in number, were purchased in the open market; they were aged but otherwise in fair condition and were subjected to the agglutination, complement fixation, and ophthalmic mallein tests previous to vaccination. The animals were kept in corrals and after vaccination were exposed to 2 animals which were artificially infected with the glanders organism. All of the animals were subjected periodically to a clinical examination.

In order to note whether any of the vaccinated animals were infected with the latent form of the disease, they were tested by the ophthalmic method. The method gave surprising results inasmuch as 2 of the vaccinated horses yielded a marked reaction. The glandered horses to which the animals were exposed also reacted strongly, as did also one of 2 check animals held in the corral for control purposes. One month later the animals reacted again but not quite so intensely. The 2 vaccinated horses and the check horse, when killed some months later, were found to have pulmonary glanders.

During the process of immunization the blood of all the horses was submitted to the agglutination and complement fixation tests. "It was found that the agglutination value of the serum of the vaccinated horses, as a rule, increased from the third day after the first vaccination and continued to rise for

a time. A decrease was again noted from 2 to 4 weeks after the last vaccination and appeared practically normal after 6 weeks to 2 months. A complement fixation with the sera of the vaccinated horses was obtained from the seventh to the ninth day after the first vaccination and they continued to give positive fixations from 2 to 3 months after the last vaccination. These serological results appeared only in the animals which gave no reaction to the ophthalmic test, while the blood of those vaccinated horses which gave a positive reaction to the eye test continued to give a positive fixation until they had been destroyed and proved to be affected with the disease. The same condition was observed in the animals which had been artificially infected with glanders.

"The serological results from these investigations appear to have a great significance with reference to the immunity produced by the injection of dead glanders bacilli. The fact that the demonstration of the presence of immune bodies in the vaccination horses ceased entirely in 2 or 3 months from the last vaccinated would indicate that after the lapse of such a time the animals have very little or no immunity against the disease. This is further substantiated also by the agglutination value of the sera returning to the normal level. . . .

"The results obtained by these investigations appear to be sufficient to demonstrate the unsatisfactory results of this method of immunization. Of the immunized animals, 3 contracted the disease from natural exposure, which is a large proportion when it is considered that all animals were aged and kept most of the time during the exposure out of doors. On the other hand, the fact that of the 2 check animals only one contracted the disease is additional evidence of the moderate character of the exposure, which further suggests the ineffectiveness of the immunization. In artificial infections of the vaccinated animals they showed no resistance whatsoever, as both vaccinated horses promptly developed an acute form of the disease from touching the Schneiderian membrane with a platinum loop, which has been touched to a growth of glanders bacilli. Thus for the present it seems advisable to abstain from immunizing horses by this method, as a practice of this kind may do more harm than good. Owners having horses which are supposedly immunized would naturally become careless, thinking their animals were resistant to the disease, and thus even a better opportunity would be offered for the propagation of the disease than if the horses were not vaccinated. Furthermore, the fact that the blood of vaccinated animals can not be utilized for serum tests for 2 or 3 months after the injections is also a great disadvantage in the eradication of the disease.

"As a result of this preliminary work it appears that the control and eradication of glanders must still be dependent upon the concentration of our efforts in eliminating infected horses and the adoption of proper precautions against the introduction of infected animals into stables free from the disease."

About the curative action of mallein in continuous but not specific secretion of the nose, ISNARD (*Abs. in Berlin. Tierärztl. Wchnschr.*, 29 (1913), No. 24, p. 438).—After giving one or two injections of mallein subcutaneously to subjects, the flow stopped in about one month postinjection.

Some bacteriological and environmental factors in the pneumonias of lower animals with special reference to the guinea pig, T. SMITH (*Jour. Med. Research*, 29 (1913), No. 2, pp. 291–323, pls. 3, figs. 2).—"The guinea pig is the host of 2 pneumonia-producing bacteria: (a) A minute motile bacillus, originally (but imperfectly) described by Tartakowsky, rediscovered and independently named by 3 workers subsequently, and redescribed in 1910 by M'Gowan as the cause of canine distemper (*Bacillus bronchisepticus*). It was encountered by Mallory in his studies on pertussis. It has been under observa-

tion by the writer since 1899; and (b) *Diplococcus pneumonia* or pneumococcus which also produces adhesive pleuritis, pericarditis, suppurative peritonitis, and general septicemia. In the author's studies, the pneumococcus infection was usually grafted on the pneumonia due to the motile bacillus. A study of the work of earlier observers indicates that both organisms have manifested gross differences in virulence in different epidemics.

"Independent of and frequently associated with pneumonic lesions due to the motile bacillus is an extreme fatty degeneration of the liver, lungs, and other organs of chiefly female guinea pigs leading to death just before or after parturition. The fatty degeneration as well as the pneumonia is almost wholly limited to the winter season (December-May).

"The motile bacillus lives over from winter to winter in old pneumonic foci or in the air tubes, attached to cilia, as described by Tartakowsky. It does not occur as a parasite of the air tubes in all guinea pig populations and attempts should be made to breed from noninfested stock.

"The reason for the seasonal incidence of pneumonia is not demonstrated. It evidently depends on a variety of interlocking, external as well as internal, factors, without the help of which the micro-organisms can not multiply in the parenchyma of the lungs."

A bibliography of 24 titles is appended.

About the diagnosis of trypanoses in general and the possible differentiation of the trypanosomes causing the disease by the aid of sera from highly immunized animals, A. LANFRANCHI (*Clin. Vet. [Milan], Rass. Pol. Sanit. e Ig.*, 35 (1912), No. 19-22, pp. 928-945; *abs. in Berlin. Tierärztl. Wehnschr.*, 29 (1913), No. 26, p. 470).—In previous work^a it was shown that nagana trypanosomes, which had been repeatedly passed through the spleens of dogs, suffered a marked decrease in virulence. By simultaneously injecting (subcutaneously, intravenously, or intraperitoneally) the dogs so treated with a slightly attenuated virus, an immune serum of high potency was obtained. The experiments have now been continued with an immune serum of this character, and tests were made with the agglutination, precipitation, and complement fixation tests for the purpose of determining whether the various trypanosomes could be differentiated from one another, especially nagana and the organism causing dourine.

The results can be summarized as follows: The serum from dogs which were highly immunized against nagana possesses a high agglutination value (1:75,000), but agglutinates *Trypanosoma brucei* and *T. equiperdum* in the same dilution and just as rapidly, consequently the method can not be used as a differential method. With the precipitation reaction, however, it was found that if nagana serum was mixed with the serum from an animal artificially infected with *T. brucei* or with *T. equiperdum* in the ratio of 1:3 a marked difference could be noted between nagana and dourine. In the case of nagana a positive reaction was obtained, irrespective of whether the serum was taken at the beginning, the height, or the end of the disease, while with dourine a negative reaction was shown at the beginning and end of the disease. Positive results at the height of the dourine infection were only obtained with guinea pigs, and only when the serum present was greater than the ratio mentioned above. The serum from mice affected with dourine was not precipitated at the height of infection, not even when a large amount of serum was added. The sera from nagana and dourine behave alike with the complement fixation reaction and react positively in all stages of the disease, consequently this can not be used for differential purposes.

^a Berlin. Tierärztl. Wehnschr., 26 (1910), No. 13, p. 285.

Tuberculosis in animals, A. E. METTAM (*Dept. Agr. and Tech. Instr. Ireland Jour.*, 13 (1912), No. 1, pp. 114-126).—This is a clear statement of the facts regarding tuberculosis under the following headings: Cause, methods of infection (inoculation, inhalation, ingestion, urinogenital); dissemination of virus, diagnosis, clinical examination, and the elimination of tuberculosis from infected herds.

Memorandum on tuberculosis in relation to the cattle industry, J. R. CAMPBELL (*Dept. Agr. and Tech. Instr. Ireland Jour.*, 13 (1913), No. 2, pp. 235-238).—A summary of facts relating to the part which tuberculous cows play in the transmission of tuberculosis to man, especially in milk. This article is based on the findings of the Royal Commission, but more especially upon Mettam's paper noted above.

Tubercle bacilli in the circulating blood, E. QUERNER (*München. Med. Wchnschr.*, 60 (1913), No. 8, pp. 401-404; *abs. in Deut. Med. Wchnschr.*, 39 (1913), No. 11, p. 522).—The sediment obtained from the blood of 37 chronically infected human subjects was injected into animals for the purpose of detecting the virulent tubercle bacillus. Negative results were obtained, and the findings of Rumpy are criticized.

Some further investigations in regard to open liver tuberculosis in the bovine and pig, E. JOEST and M. ZIEGLER (*Ztschr. Infektionskrank. u. Hyg. Haustiere*, 14 (1913), No. 1, pp. 9-40, pls. 3).—As a continuation of previous work^a, the authors report this data on the presence of tubercle bacilli in the bile of tuberculous animals for the purpose of establishing the manner in which the tubercle bacilli enter the bile and to make a histologic study of the tuberculous foci found in the liver, with particular reference to the biliary channels.

The work was carried on with the livers of 130 bovines and pigs from the Dresden slaughterhouse. In 26 cases guinea pigs treated with bovine bile died prematurely as a result of the administration of the toxic bile. These animals were not included in summing up the results of the experiments. Of the remaining 104 livers 76 (53 hogs and 23 bovines) came from animals having a local infection of the liver, and the remaining 28 came from 24 hogs and 4 bovines having a generalized tuberculosis. In 15 out of the 104 cases tubercle bacilli were detected in the gall bladder. In local tuberculous cases the animal test with guinea pigs showed positive in 8 instances (7 bovines and 1 hog), and in the generalized tuberculous cases in 7 instances (3 bovines and 4 hogs).

A tuberculous liver is supposed to be a greater factor for the expulsion of tubercle bacilli than the presence of bacilli in the arterial blood stream. Great stress is laid upon the significance of liver (open) tuberculosis as a factor in spreading the disease among animals.

About the elimination of tubercle bacilli with the bile of tuberculous bovines and goats, C. TITZE and E. JAHN (*Arb. K. Gsndhtsamt.*, 45 (1913), No. 1, pp. 35-58).—These experiments are along the same lines as those reported by Joest and Emshoff (see above), Calmette and Guérin (*E. S. R.*, 21, p. 683), and others, and include the study of 36 bovines and 4 goats.

In the experiments it is shown that tubercle bacilli when exposed to the action of bile for 4 days lose none of their virulence. Twenty-six of the bovines under examination were cases of spontaneous tuberculosis and 11 of these were found with the guinea pig test to contain tubercle bacilli in their bile. Six of these showed pathologic changes in the liver, and 4 showed changes in the portal lymph tract. In the remaining animal, a 7-year-old, well-nourished

^a *Ztschr. Infektionskrank. u. Hyg. Haustiere*, 10 (1911), No. 4, pp. 197-206.

bull, no changes were noted either in the liver or the portal lymph glands, but the mesenteric glands were enlarged and contained cheesy foci while the bronchial and mediastinal lymph nodes showed encapsulated areas. No other changes were manifest.

Ten bovines and 4 goats were artificially infected and the biles of these were examined. Only a slight tuberculosis was induced in some of these animals, and in almost every case the bile when given to guinea pigs failed to produce tuberculosis. Six bovines were given subcutaneous and intrapleural injections and 4 bovines and 4 goats intravenous injections. One of the 4 bovines slaughtered 7 days after infection showed no lesions, and subcutaneous injections of emulsions of the kneefold and popliteal lymphatic glands, kidneys, muscles, and blood from this animal into guinea pigs did not produce the disease. A piece of the popliteal lymphatic glands, however, placed under the skin of a guinea pig produced tuberculosis in that animal. Of the other 3 animals 2 showed miliary tuberculosis with no tubercle bacilli in the blood, but 1 of the 2 had tuberculosis of the portal lymph glands.

In the 4 goats bovine tuberculosis was produced and after slaughter the organs and blood from the animals were found to be very virulent. The livers, on the other hand, were not affected. The authors conclude that infection by way of the blood stream with regard to the elimination of tubercle bacilli with the bile has not the importance which is usually attached thereto. This coincides with the views of Joest and Emshoff. Liver tuberculosis, however, should be considered when measures of control against the disease are enforced. In most cases pulmonary tuberculosis is present at the same time with liver tuberculosis.

About the experimental production of tubercular antibodies in the bovine, and a contribution to immunization against tuberculosis, E. ROTHE and K. BIERBAUM (*Berlin. Tierärztl. Wchnschr.*, 29 (1913), No. 19, pp. 341-344).—The purpose of this work, which was begun in 1909, was to devise a method whereby tubercular antibodies could be produced in the bovine in large amounts and in a very short time, and, furthermore, to determine if the antibodies produced had protective and curative qualities. The sera obtained in the tests were examined with the complement fixation and precipitation methods.

The results show that by a single intravenous injection of bovines (tubercular animals, nontubercular animals, animals hypersensitive toward tuberculin, and nonhypersensitive animals) with dead intact bacilli in doses of from 30 to 50 mg., it was possible to produce in the serum a large number of specific complement-fixing amboceptors and precipitins. The formation of experimentally produced complement-fixing amboceptors and precipitins was found not always to run parallel in bovines and horses.

By the repeated intravenous treatment with dead bacilli it was possible in bovines to produce a marked protection against a later infection with living, fully virulent bovine tubercle bacilli. Sera which are rich in complement-fixing amboceptors and precipitins also seem to have some influence on virulent tubercle bacilli, because after a long contact with them they appear to diminish the virulence of these organisms. The rise in temperature produced as a result of injecting the organisms has no diagnostic significance. The sera containing many tubercular antibodies can eventually be used as an indicator for the strength of various tuberculins.

Tuberculosis and pearl disease, A. BESSERER (*Festschrift 84. Versamml. Deut. Naturf. u. Ärzte von der Med. Naturw. Gesell. Münster, 1912, pp. 388-404*).—Cultures were obtained from 23 human tuberculous patients. The majority of these were cases of pulmonary tuberculosis, while the remainder consisted of cervical, intestinal, kidney, and brain tuberculosis. The cultures

were compared with the bovine type of tubercle bacillus obtained from the Institute of Infectious Diseases at Berlin. All of the cultures were first examined to see whether there were any atypical strains among them. In addition, the Theobald Smith acid curve was noted. The latter method is recommended on account of its simplicity and accuracy.

In all, 116 rabbits were vaccinated with the human strain. Sixty-seven of these received subcutaneously 0.001 gm. of pure cultures. No animal died from tuberculosis but 16 died spontaneously from coccidiosis and a few from pneumonia and a rabbit disease. In 40 per cent of the cases on autopsy submiliary to pinhead size tubercles were present in the lungs. In the animals which were killed at a later date evidences of healing were often seen. No tuberculosis of the glands or kidneys (which is often noted in the group of rabbits treated with the bovine culture) was ever seen in the animals treated with the human cultures.

Three pure cultures obtained by the antiformin method gave the characteristics of the human tubercle bacillus, but when injected they had no effect upon the lungs of rabbits and consequently it is concluded that antiformin injures the tubercle-producing powers of the organism.

Several pages are devoted to the variability factor and the frequency which the bovine type of organism is detected in the sputum of man when affected with tuberculosis.

The specific paratuberculous enteritis of cattle in America, K. F. MEYER (*Jour. Med. Research*, 29 (1913), No. 2, pp. 147-189, pl. 1).—"The paratuberculous enteritis found in America is identical with the disease of European countries. By intravenous inoculations with material from the mesenteric lymph nodes, the disease has been reproduced in young calves (30, 92, and 96 days of age). The incubation time was from 4 to 8 months. One animal died from the disease 12 months after the infection. Feeding experiments were not successful. The natural infection probably takes place in the early days of life by contact with infected mothers or surroundings. The possibility of an infection in certain pastures, where *B. paratuberculosis* leads a saprophytic life, can not be denied, and is probably of importance for the infection in adults. *B. paratuberculosis* can be cultivated on solid and liquid culture media containing glycerin extracts of acid-fast bacilli, particularly tubercle bacilli of *B. phlei*. Six strains have so far been isolated. The growth is slow and only possible at body temperature. A culture medium consisting of equal parts of tuberculin and bouillon, with 2 per cent agar and 1 per cent serum, is the best for primary isolations. The use of antiformin should be limited to contaminated material.

"The bacterioscopic examination of feces and rectal scrapings is only of diagnostic value in about 40 per cent of the cases in the advanced stages of the disease. Avian tuberculin is an unreliable reagent for paratuberculosis. 'Paratuberculin,' and perhaps some of the serum tests, may prove in the future to be more reliable. *B. paratuberculosis* is, in certain respects, related to different representatives of the acid-fast group of bacteria."

A bibliography of 33 titles is appended.

The persistence of the bacillus of infectious abortion in the tissues of animals, W. E. COTTON (*Amer. Vet. Rev.*, 44 (1913), No. 3, pp. 307-318).—The conclusions drawn from this paper, presented at the fiftieth annual meeting of the American Veterinary Medical Association in New York, September, 1913, are as follows:

"The bacillus of infectious abortion, or at least the strains with which the experiment station has worked, may, and in most cases does, persist in the udders of cows that have aborted for years and possibly for the balance of

their lives; and during this time is eliminated more or less continuously with their milk. It may make its appearance in the milk months before abortion occurs, even before a conception that is terminated by an abortion. It may be eliminated for years from the udders of cows that never aborted. It may persist in the genital tract for as much as 46 days after an abortion; and the bacilli contained in uterine discharges may resist the action of sun and weather for at least 10 days. It may appear in the placenta of a normal pregnancy subsequent to an abortion. It may persist in the spleens of inoculated guinea pigs in which there are lesions for 77 weeks, and in the spleens of inoculated rabbits for 19 weeks, without producing lesions."

See also a previous note (E. S. R., 29, p. 778).

The poisoning of cattle in the pasture, C. K. FRANCIS (*Oklahoma Sta. Rpt. 1913, pp. 20-29, figs. 2*).—This is a general review of the subject with references to and quotations from the literature. It is stated that there are periods during the year when almost every mail brings one or more reports of animal poisoning, the number of animals dying suddenly in Oklahoma each year being very large.

The author's investigations have shown hydrocyanic acid to be present in Kafir corn at every stage, except the mature stage. "From all data recorded it appears that stunted plants showing the need of rain are especially dangerous. All young growth of the sorghum group are liable to contain the poison. The second growth and frosted plants have also been shown to be unsafe. The samples containing the larger amounts of prussic acid were very bitter to the taste, and this characteristic may be used as a rough test of the condition of the plants. If it is necessary to pasture stock in fields while the growth is at the various stages mentioned, the animals should be allowed to remain but a few minutes at first, or the material tested by turning in an animal of little value. If a hungry animal refuses to feed on green plants, you may be certain that they are not safe."

The morphology of the sheep tapeworm (*Thysanosoma actiniodes*), L. D. SWINGLE (*Wyoming Sta. Bul. 102 (1914), pp. 103-116, figs. 31*).—While the fringed tapeworm of sheep, as it is commonly called, is very prevalent in Wyoming, most of the sheep slaughtered at Laramie being infected, neither its anatomy nor life history has been worked out. The present paper consists entirely of an illustrated report of studies of its anatomy.

Effect of dips on wool, C. MALLINSON (*Agr. Jour. Union So. Africa, 6 (1913), No. 4, pp. 671-678*).—The author, a sheep and wool expert, reports that during a trip to Great Britain he failed to hear of any serious complaint about the scouring of South African wool or of any difficulty in dyeing. He recommends that South African farmers continue to dip for scab as recommended by the department of agriculture.

The prophylaxis, serum-therapy, and serovaccination of contagious agalaxia, H. CARRÉ (*Rev. Gén. Méd. Vét., 20 (1912), No. 238, pp. 529-538; abs. in Jour. Compar. Path. and Ther., 26 (1913), No. 1, pp. 67-69*).—It is shown by this work that the mammary secretion may be infectious for months and even up to the time when there is complete atrophy of the gland. That the milk does not rapidly lose in virulence is shown by the fact that an infected milk, kept for 8 days at room temperature during the month of August, when injected into the teat of a goat produced a typical attack of the disease. In every flock examined the occurrence of the disease was observed to follow the introduction of new animals from the outside. Attendants also carried the disease from one flock to the other.

Some experiments regarding serum-therapy and serovaccination against the disease were conducted. "In the first flock there were 34 diseased and 80

healthy animals. Of these latter 60 were given 5 cc. of protective serum subcutaneously, the others being kept as controls. Three weeks later 7 of the control animals were affected, but all those that had received a dose of serum had escaped infection. In view of the fact that the immunity conferred by the serum was effective for 2 to 4 weeks only, an attempt was made to prolong the period by giving an inoculation of serum and virus mixed. The 60 animals were therefore given 5 cc. of serum mixed with $\frac{1}{16}$ cc. of virulent pleural exudate from an experimental case. Two months later it was reported that none of the protected animals had become infected, while the control animals had.

"A second flock was divided into 2 lots of 100 animals each, which were placed in folds about 200 yds. apart. The disease broke out in a severe form in 1 of the folds, and within 3 weeks 40 of the animals were dead, and the others were in a very poor condition. The flock in the second fold remained free of the disease. Contagion was, however, inevitable, as the same persons attended both lots of animals. The whole of the healthy batch received 5 cc. of serum subcutaneously, but a week later 2 animals were found to be diseased. In the author's opinion these animals were in the incubation state when the serum injections were given, and the fact that they contracted the disease showed that the fold was infected. The same day 50 healthy adult animals in the fold were given a dose of serum and virus as in the case of the first flock mentioned. At the request of the owner 10 of these animals were placed with the infected batch. None of the vaccinated animals had contracted the disease 2 months later. Even those placed with the diseased animals had remained free.

"A third flock numbering 110 ewes contained 2 diseased animals. Serovaccination was practiced on the whole flock, and no fresh cases had appeared up to 3 months later."

From the experiments the author concludes that the antiagalaxia serum possesses immunizing properties, but it seems to be without value when given during the period of incubation or after the symptoms have appeared. Serovaccination prolongs the immunity conferred by the serum alone, but the duration of the immunity so produced has not been established. It is of sufficient length, however, to allow an epidemic to die out.

Spirochetes in hog cholera, G. ARNHEIM (*Ztschr. Hyg. u. Infektionskrank.*, 76 (1914), No. 3, pp. 435-437).—Hog cholera, according to this investigation, is not caused by spirochetes. The findings of King, Baeslack, and Hoffmann (*E. S. R.*, 29, p. 681) are criticized on the ground that up to this time spirochetes have not been filtered under pressure, and furthermore, that salvarsan, a well-known spirochete poison, is not of any value in hog cholera. In the hog cholera virus, however, certain transitional forms were noted.

From the blood taken from the tails of infected hogs spirochetes were found, but none were noted in the blood obtained by puncturing the heart. Spirochetes were also noted in the intestinal tract where a slight intestinal diphtheria was present. From the mesenteric lymph glands of a pig dying of hog cholera and a severe intestinal diphtheria the same spirochete could be obtained by cultivation by Schereschewsky's mixed culture method.

The spirochetes found in hog cholera are believed to originate from the intestines.

Hog cholera investigation, R. A. CRAIG (*Indiana Sta. Rpt.* 1913, pp. 76-79).—In testing the comparative virulence of the virus in blood, urine, and filtered and unfiltered salt solutions from cholera hogs, pigs weighing from 30 to 60 lbs. were injected intramuscularly. Pigs inoculated with the virus in blood lived an average of 12.08 days; those with virulent salt solution, 12.92 days;

those with the filtrate of virulent salt solution, 12.37 days; and those with urine, 13.54 days. The author has been unable to attenuate the hog cholera virus in either blood or salt solution so as to produce a successful vaccine. He states that virulent salt solution obtained from hogs fatally sick with hog cholera 3 hours after a physiological salt solution has been injected into the abdominal cavity at the rate of 10 to 20 cc. per pound of body weight is now being made use of in the production of hyperimmunes by the intramuscular method.

Cholera vaccination and carcass values, O. W. JOHNSON (*Breeder's Gaz.*, 65 (1914), No. 2, p. 60).—The author presents evidence to show that some of the hog cholera serum which has been used in Iowa contains pyogenic organisms. In certain herds given special care during the treatment nearly all the hogs had abscesses form, while in other herds in which less care was taken, the hogs have been nearly free from abscess formation.

Suptol in acute swine plague, WELDES (*München. Tierärztl. Wchnschr.*, 56 (1912), No. 24, pp. 425-427; *abs. in Berlin. Tierärztl. Wchnschr.*, 29 (1913), No. 24, pp. 438).—In one barn hogs were given curative treatment for acute swine plague and with satisfactory results. With 100 hogs, which had the chronic form of the disease, partly good and partly unsatisfactory results were obtained.

Studies on the etiology of epizootic abortion in mares, K. F. MEYER and F. BOERNER (*Jour. Med. Research*, 29 (1913), No. 2, pp. 325-366, pls. 2).—"In an outbreak of epizootic abortion in mares in Pennsylvania it was proved by our investigations that the causative agent was a bacillus belonging to the subgroup C of the paratyphoid-enteritidis group. For this bacillus we propose the name *Bacillus abortus equi*. *B. abortus equi* fulfils all the requirements of the organism belonging in the paratyphoid B group, but the growth on the slanted agar being membranous, dry, and brittle, and there being a considerable amount of gas production in dulcete, these can be used for differentiation. *B. abortus equi* is agglutinated by a paratyphosus B, or enteritidis (Gaertner) serum, only in low dilutions.

"With cultures of the organism, abortion could be produced by the subcutaneous, intravenous, intravaginal, and alimentary infection in a pregnant cow, goat, sow, and small animals like guinea pigs and rabbits. The average incubation time was 15 days. *B. abortus equi* is pathogenic for guinea pigs, rabbits, mice, rats, and pigeons. The anatomical lesions are similar to those seen in paratyphoid infections. Rabbits are more susceptible to the infection than guinea pigs. Agglutination and complement fixation are suitable methods for determining the existence of an infection by *B. abortus equi*. Further investigations are necessary to prove the existing theories of natural infection."

A bibliography of 16 titles is appended.

Blackhead of turkeys, H. J. WHEELER (*Rhode Island Sta. Rpt.* 1912, pp. 205-209).—The author reports that studies of the past 2 years under the direction of P. B. Hadley have demonstrated conclusively that blackhead of turkeys is a pathological condition related etiologically to at least 2 species of protozoan parasites, namely, *Eimeria avium* and a flagellated organism still unknown except in a few stages of its development. A large number of experiments show that it is practically impossible in Rhode Island for young turkeys to escape the blackhead parasites. Work carried on with intestinal antiseptics, chiefly with Formidine and Resor-bisnol, has thus far given rather unfavorable results. While post-mortem examinations indicate that Formidine serves to reduce the severity of the cecal lesions, it does not appear to have favorably modified the lesions of the liver which may be present without any pathological condition of the ceca.

In studies of the coccidium and flagellate in artificial culture alkaline media furnished a condition favorable to rapid development, while acid media restricted development. Milk soured by means of inoculation with pure cultures of a strongly acid producing micro-organism (*Bacterium bulgaricum*) was fed in large amounts. It is relished by the poults and up to the time of writing has shown a marked tendency to prevent manifestation of the severe clinical symptoms and pathological appearances of the disease, at least during the early critical period (thirty-fifth to fiftieth day).

The parasitocides, A. RICHAUD (*Arch. Par.*, 16 (1913), No. 1, pp. 5-133).—A series of lectures by the author.

RURAL ENGINEERING.

American irrigation farming, W. H. OLIN (*Chicago*, 1913, pp. 364, pls. 57, figs. 5).—This book treats the history of irrigation developments, the fundamental terms in irrigation practice, soil study, seed bed preparation, seed selection, methods of water distribution, cropping "under the ditch" with special reference to alfalfa, potatoes, small grains, sugar beets, orchards, trucking, forage crops, crop rotations, and live stock, concluding with statistical data relating to the Reclamation Service and its work, rules for measurements, and other tabular matter. A bibliography of 88 titles of agricultural books is appended.

Irrigation in the British Indies, A. NORMANDIN (*Bul. Écon. Indochine*, n. ser., 16 (1913), No. 103, pp. 618-756, pl. 1, figs. 41).—This report describes the geography, meteorology, geology, agricultural conditions, and irrigation possibilities of the region and discusses in some detail irrigation technique, finance and economy, cost of construction and maintenance of irrigation works, irrigation by pumping, private irrigation systems, drainage of irrigated lands, and flood protection. In addition some of the unfinished irrigation works of the region and their irrigating possibilities are described.

Irrigation works, E. S. BELLASIS (*London and New York*, 1913, pp. VII+199, pls. 6, figs. 33).—This book deals with the principles governing the design and management of irrigation works, refers to irrigation works of various countries, and particularly discusses the canals of northern India as a basis for the principles and methods to be adopted in the design and improvement of irrigation channels.

Irrigation and water conservation in western Australia, H. OLDHAM and J. F. MOODY (*Perth, Aust.: Dept. Agr. and Indus.*, 1913, pp. 37).—The possibilities existing in western Australia relative to the development of water resources, especially for irrigation purposes are discussed, and in this connection attention is drawn to the many natural advantages of the region and to the need for their use in the promotion of settlement under methods of intense culture. Descriptions are given of several existing irrigation systems in different parts of the world to illustrate the possibilities in this direction.

Hints on irrigation.—Pumping plants, W. M. WATT (*Rhodesia Agr. Jour.*, 11 (1913), No. 1, pp. 52-63).—Information is given which is intended to guide farmers in the selection and proper erection of small pumping plants for irrigation purposes in Rhodesia.

Spraying systems in the Province of Posen, F. SCHEEFFER (*Maschinen Ztg.*, 11 (1913), No. 21, pp. 252-254, figs. 3).—Two different systems of spray irrigation are described, in both of which a system of mains is placed underground and fitted with hydrants at convenient intervals. The spray apparatus carried on trucks is connected to the hydrants by portable pipe lying in sections so

as to be easily disconnected and moved to different parts of the field. Trials of these systems showed them to be fairly satisfactory but relatively expensive.

Causes of inefficiency of irrigation, A. S. GIBB (*Engin. Rec.*, 68 (1913), No. 22, pp. 608, 609, fig. 1).—In an investigation of the causes which influence the economical application of irrigation water on a large irrigation system of the Punjab in India, it was found that the degree of liberality of water allowance is the main factor causing the rapid rise of underground water level and consequent water logging of the soil and the waste of large quantities of irrigation water. To remedy these conditions it is concluded that a little can be done by educating all the cultivators up to the standard of the best and by subdividing the lands so as to suit the most economical discharge of water, but that much more can be effected by increasing the accuracy with which the water is distributed to the lands of the cultivators.

Silting in the Shabshir and Ikhnawai canals, K. O. GHALEB (*Cairo Sci. Jour.*, 7 (1913), No. 84, pp. 194–200, pls. 3, fig. 1).—Mechanical analyses were made of the silt samples taken at various points in the deposits in these canals, from which the nature and cause of the silting and the necessary remedies were determined.

Metal flumes for irrigation canals, F. W. HANNA (*Engin. News*, 70 (1913), No. 22, pp. 1077–1079, figs. 6).—This article deals with the factors governing the design and construction of 3 general types of semicircular metal flumes, namely, the rough transversely corrugated interior, semirough interior, and the smooth interior types. Methods of metal flume design and construction employed on the Boise irrigation project are described.

Drainage and irrigation: Approximate formula and table for proportioning priming pumps for centrifugal pumping plants, C. R. SESSIONS (*Engin. and Contract.*, 40 (1913), No. 23, pp. 628, 629, fig. 1).—An approximate formula is derived and tables given to serve as a guide in properly proportioning or selecting an air pump for priming centrifugal pumps.

Drainage, W. O. HOTCHKISS, E. M. GRIFFITH, and E. R. JONES (*Rpt. Conserv. Com. Wis.*, 3 (1912), pp. 52–60, fig. 1).—It is stated in this report that the marsh lands which it is possible to drain in Wisconsin comprise nearly 3,000,000 acres, or about 7.8 per cent of the total area of the State. The three possible uses to which these lands may be put are discussed as for agricultural purposes, for sources of peat, and for reservoirs for the regulation of stream flow both for the benefit of water power and the prevention of floods. Recommendations are made regarding suitable changes in the drainage laws of the State.

The drainage of wet and marshy lands for agricultural purposes, E. R. JONES (*Rpt. Conserv. Com. Wis.*, 3 (1912), pp. 61–67).—In connection with the drainage of swamp lands the author points out the agricultural value of muck and peat.

Soil drainage, A. G. MCCALL (*Fruit World Austral.*, 14 (1913), No. 4, pp. 98–104, figs. 12).—This briefly reviews the fundamental and practical considerations in proper soil drainage, calls attention to the benefits derived from the draining of alkali soils, and includes an article on good effects of tile drainage, by R. M. Dolve.

A method of making rough estimates for roads in hilly country, J. D. MAITLAND-KIRWAN (*Indian Forester*, 39 (1913), No. 10, pp. 477–486, figs. 5).—The operation of a handy instrument for use in preparing estimates for roads running along moderately steep hillsides in cut is described.

Economic results of surface tarring, E. GUGLIELMINETTI (*Good Roads, n. ser.*, 6 (1913), No. 10, pp. 111, 112).—In a paper presented at the Third International Road Congress, London, it is concluded that surface tarring does not

give such appreciable results on metaled roads with heavy vehicles and intense traffic as on metaled roads with a moderate traffic, since the metaled road itself does not wear well under heavy vehicles and intense traffic. To obtain good results it is not only necessary "to adopt a good system of surface tarring but the roads on which it is done must be selected judiciously."

Concrete highways (*Philadelphia, 1913, pp. 114, figs. 62*).—This pamphlet deals with the design and construction of concrete highways and with different types of wearing surfaces. Specifications are included for 1- and 2-course pavements, bitumen and sand wearing surfaces, and reinforced concrete pavements.

The effect of salts upon the strength of concrete cured at low and normal temperatures, H. E. PULVER (*Wis. Engin., 18 (1913), No. 1, pp. 6-13, figs. 4; abs. in Cement Era, 11 (1913), No. 11, p. 41*).—Tests are reported which were conducted to determine the effect of sodium chlorid and calcium chlorid separately and together on a 1:2:4 concrete, cured at normal room temperature and at temperatures below freezing. The salts were dissolved in the mixing water in the following percentages by weight: Sodium chlorid 6, 9, 12, and 15; and calcium chlorid 2, 4, 6, 8, and 10.

The results show that the strength of the concrete cured under normal temperature decreased as the percentage of sodium chlorid increased. For the concrete cured at low temperature there was an increase in strength for the addition of sodium chlorid up to 12 per cent after which there was a decrease. The addition of calcium chlorid increased the strength of this concrete up to about 4 per cent at which point the maximum strength was reached.

Serious disintegration was observed on the surfaces of cubes cured at low temperatures and containing 6, 8, and 10 per cent of calcium chlorid. The best effect was obtained at low temperatures by using both sodium chlorid and calcium chlorid in the mixing water, a 2 per cent calcium chlorid and 9 per cent sodium chlorid mixture giving the best results.

Explosives in agriculture, F. R. TRELEAVEN (*Queensland Agr. Jour., 31 (1913), No. 4, pp. 201-204*).—From the successful results of "experiments carried out covering a period of the past eleven years", the author briefly reviews methods of using both nitroglycerine and chlorate compounds for land clearing, subsoiling, log splitting, ditching, and drainage. He recommends the chlorate compounds for the heavier blasting on account of their higher rending and energy retaining powers.

Electricity for the farm and home, F. KOESTER (*New York, 1913, pp. XX+279, pl. 1, figs. 53*).—This book includes the following chapters: Benefits of agricultural electricity, central station service, generating electric power, electric motor applications, cost of operating, electricity in the manufacture of farm by-products, electricity in the preservation of farm products, electric transportation of farm products, electric plowing, diverse applications of electricity, electric heating, electric lighting, the telephone in rural communities, electric power in irrigation, and electric stimulation of vegetation.

Economics of rural distribution of electric power, L. E. HILDEBRAND (*Univ. Mo. Engin. Expt. Sta. Bul., 4 (1913), No. 1, pp. 50, figs. 12*).—This paper is primarily a discussion of the economic problems of the rural distribution of electric power and is intended to be of interest to farmers, central station managers, and engineers. It takes up in some detail the application and advantages of electric power to farms, discussing these questions from the standpoint of private and isolated generating plants on the one hand and rural distribution systems on the other. Typical installations of both systems are described and the fundamental, technical, and practical points to be considered in the design and installation of a rural electric distribution system are out-

lined in some detail. In connection with the practical application of electric power to the belt work of farms a table of useful data is given showing the amount of power required and the cost of performing several farm operations at various rates.

It is concluded that electric motors can be profitably used almost daily in many farm processes because of their convenience, ease of operation, flexibility, lack of noise and dirt, long life, small repair charges, and general economy, but that it is usually uneconomical for farmers to own and operate isolated plants since the fixed charges are high and such plants are not well adapted to supplying motors with power. It seems preferable and more profitable to distribute power from a central electric plant by means of a high voltage distribution system. "The best system will usually be found to be a three-phase system, either 3 or 4 wire, with a voltage such that standard 2,200 or 6,600 volt distributing transformers can be used."

Small central stations supplying power to farmers only and with no other market are not thought to prove successful financially. Distribution from a city central electric station or a long distance high voltage transmission line is recommended where feasible.

Mechanical efficiency of gasoline engines, S. F. WILSON (*Power*, 38 (1913), No. 18, p. 605).—A method for closely approximating the mechanical efficiency of gasoline engines of the hit-and-miss type with constant gasoline level feed is suggested which is based on the number of explosions at full and no load. The formula for this method is: Mechanical efficiency = $\frac{Ne - No}{Ne}$. In this formula Ne equals the number of explosions per minute at full load and No equals the number of explosions per minute at no load.

Thrashing with steam engine or electric motor, P. TIETZ (*Deut. Landw. Presse*, 40 (1913), Nos. 82, pp. 979-981; 83, pp. 995-997).—Comparative tests were made of steam and electric power for thrashing on 2 farms. On the first farm a thrasher with a 22 by 60 in. cylinder was driven by a 32 h. p. electric motor and by a 25 h. p. portable steam engine. On the second farm a thrasher with a 24 by 66 in. cylinder was driven by a 40 h. p. motor and a 31 h. p. portable steam engine.

The results show little difference in the amounts of grain lost by the 2 kinds of power, the loss being below 0.3 per cent in both cases. The results on cost per horsepower hour, total accomplishment, speed, efficiency, etc., show that in both sets of tests the steam engines were essentially cheaper and more efficient than the electric motors.

The present state of motor cultivation in Germany, G. FISCHER (*Internat. Inst. Agr. [Rome]*, Mo. Bul. Agr. Intel. and Plant Diseases, 4 (1913), No. 6, pp. 852-858, pls. 3).—The author describes and compares a few German makes of motor plows and motor scarifiers and also some American makes of plows and tractors which have proved most successful in German agriculture.

He states that the so-called "Stock" motor plow has given the best results technically and practically as a cheap mechanical plow suited to small farms and to the shallow tillage of light soils. A summary of results obtained with motor plows in Germany shows that for shallow and moderately deep plowing of light and medium soils some very useful machines exist. Gradients above one in ten and numerous big stones are said to offer considerable difficulties, although the American plows are for the most part protected from breakage by stones by means of wooden pegs. The American tractors are said to work best on hard soils, while on soft soils plows of the Stock type are preferable. Disk plows are said to penetrate more easily to considerable depth than the other types.

Rope and its use on the farm, J. B. FREAR (*Minnesota Sta. Bul.* 136, pp. 76, figs. 180).—This bulletin is intended to cover briefly the materials, methods of manufacture, strength, and use of rope in general farm work, and to give "that information which is necessary for a thorough understanding of rope." A section on general information includes the construction of rope, sources of fiber, calculation of weight, care of rope, uncoiling rope, relaying an untwisted rope, principles and elements of a knot, strength of rope, and calculation of strength.

"Four-strand ropes have about 16 per cent more strength than three-strand ropes. Tarring rope decreases the strength by about 25 per cent because the high temperature of the tar injures the fibers." The breaking strength in pounds for new Manila rope "may be found approximately" by the formula $S=D^2 \times 7,200$, and for hemp rope $S=D^2 \times 5,400$, where S equals the breaking strength and D the diameter in inches. "The safe load is usually regarded as one-sixth of the breaking strength."

Other sections describe in detail, with many illustrations, preventing the ends of rope from untwisting, knots for tying ropes together, loops at the rope's end, loops between the rope's ends, hitches, halters and halter ties, and splices. The final section takes up blocks and tackle, discussing particularly the lifting force of blocks and maximum and safe loads. A bibliography is appended.

RURAL ECONOMICS.

Studies in agricultural economics (*Bul. Univ. Tex.*, No. 298 (1913), pp. 132).—This bulletin contains a collection of papers dealing with economic conditions in Texas. The subjects treated are as follows: The Crop Mortgage System in Texas, by S. J. Joekel; The Need and Possibility of Cooperative Rural Credit in Texas, by L. H. Haney; Cooperative Agricultural Credit, by W. Trenckmann; Cooperative Production by Farmers, by C. E. Lamaster; Cooperative Marketing of Fruit, Truck, and Cotton, Chiefly in Texas, by G. Wythe; Farmers' Educational and Cooperative Union in Texas, by H. L. Voorhies; Seasonal Industries and their Labor Supplies in Texas, by W. E. Leonard; The Farm Labor Problem, by S. M. Leftwich; A Study in Highway Administration with Special Reference to Texas' Needs, by M. H. Griffin; Railway Rates and Services as affecting the Texas Farmer, by F. L. Vaughan; The Theory and Practice of Speculation on Produce Exchanges, by R. Randolph; Farm Tenure in Texas, by W. T. Donaldson; and Our System of Taxation and its Effect on the Farmer, by B. E. Dailey.

Agriculture.—Questions of the day (*X. Cong. Internat. Agr. Gand*, 1913, *Compt. Rend.*, pp. 319–326).—This volume contains abstracts of the papers on subjects relating to rural economics at the Tenth International Congress of Agriculture at Ghent, previously noted (*E. S. R.*, 29, p. 101).

[Immigration and agricultural workers], J. A. HILL (*U. S. Senate*, 61. *Cong.*, 2. *Sess.*, *Doc.* 282 (1911), pp. 60–69).—According to the census of 1900 of the foreign born male breadwinners 21.7 per cent were engaged in agriculture, and of those born in the United States of foreign parentage 25.9 per cent. The second generation of every nationality is engaged in agriculture to a greater extent than the first generation, although those of German and Irish parentage, who comprise more than half of the breadwinners, do not show as strong a tendency as those of other parentage. The following table brings out the fact that for every aged group a larger percentage of the second generation than of the first are farmers.

Percentage of total male breadwinners of the same age engaged in agriculture.

Age	Foreign born, white.		Native white, foreign born parentage.	
	Farmers.	Agricultural laborers.	Farmers.	Agricultural laborers.
	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
10 to 15 years.....		17.4		35.6
16 to 24 years.....	2.1	13.0	4.0	21.6
25 to 34 years.....	8.3	5.3	14.1	7.4
35 to 44 years.....	13.7	3.1	20.2	3.4
45 to 54 years.....	20.1	2.8	24.2	2.8
55 to 64 years.....	26.8	3.2	30.0	3.0
65 years and over.....	34.5	4.7	37.7	3.9
Total, 10 years and over.....	14.6	5.2	13.3	11.6

Fecundity of immigrant women, J. A. HILL and J. H. PARMELEE (*U. S. Senate, 61. Cong., 2. Sess., Doc. 282 (1911), pp. 733-826*).—This investigation, based upon the census returns for 1900, brings out, among other facts, that women in cities bear fewer children than those in the rural districts. The variations are illustrated in the following table:

Average number of children born to women under 45 years of age, married 1 to 19 years.

Nativity.	Average number of children born.			
	Ohio.		Minnesota.	
	Cleveland.	Rural counties.	Minneapolis.	Rural counties.
Native white of native parentage.....	1.6	2.4	2.4	3.4
White of foreign parentage.....	3.0	3.1	3.8	5.2
First generation.....	3.4	3.5	4.0	5.5
Second generation.....	2.2	2.9	3.4	4.7

Comparative fecundity of women of native and foreign percentage in the United States, J. A. HILL (*Quart. Pubs. Amer. Statis. Assoc., n. ser., 13 (1913), No. 104, pp. 583-604*).—The data contained in this article are noted above.

The labor problem, J. LAMBIE (*Scot. Farmer, 22 (1914), No. 1099, pp. 83-85*).—After noting the changes that have taken place in Scotland between the land owning class and the agricultural laborer the author calls attention to the various schemes for improving the laborer's position. Data are given showing the average earnings of agricultural laborers in England and Scotland from 1860 to 1899.

[Land mortgage reform enacted by Wisconsin] (*Orange Judd Northwest Farmstead, 12 (1914), No. 6, p. 162*).—In Wisconsin a land mortgage association may be formed by no fewer than 15 adults with a capital stock of not less than \$10,000. It may take as security for loans a first mortgage upon agricultural lands, forest lands, or lands occupied by dwellings within the State, at not to exceed 65 per cent of the value if improved, or 40 per cent if wholly unimproved. "No single loan shall exceed 15 per cent of the company's capital and surplus. All such farm mortgages shall contain provisions for proper soil

conservation, and for annual or semiannual reduction of principal (amortization)."

Two of these associations have been organized, one at Eau Claire and the other at Marinette.

Some parcel post marketing experiments, J. R. BECHTEL (*Market Growers Jour.*, 14 (1914), No. 3, p. 83, fig. 1).—An experiment conducted by the Pennsylvania State College demonstrated that greenhouse tomatoes could be marketed by parcel post with but little loss. This loss was due principally to jamming in mail bags, and could have been greatly reduced by the use of hampers.

[Cooperative marketing of creamery butter], R. C. PORTS (*Oklahoma Sta. Rpt.* 1913, pp. 12-17).—On account of a decrease in the amount of butter manufactured at the station creamery the cost of manufacturing increased from 2.6 cts. per pound for the fiscal year 1908 to 6.73 cts. per pound for the fiscal year 1913. In order to decrease the cost of distribution the station creamery united in 1909 with 5 local creameries and concentrated their shipments at Stillwater. This resulted in lower freight cost, faster and better freight service, the butter arriving at the market in better condition, better sales from commission houses, and in each creamery receiving the benefit of improved marketing facilities from both the railroad and the commission house. The net saving in freight on 8 carloads was \$65.34 per car.

[Cow insurance club] (*Jour. Bd. Agr. [London]*, 20 (1913), No. 8, pp. 730, 731).—In this club there are 124 members, mostly small holders, and 274 cows insured. Only cows and heifers are insured. The average death rate per annum is 2.7 per cent. Three-fourths of the market value of any cow that dies from disease or accident is paid, the average being £10 14s. After the sale of the carcass the average net loss per cow insured has averaged 5s.

Pig insurance clubs in 1912 (*Jour. Bd. Agr. [London]*, 20 (1913), No. 8, pp. 721-729).—A report for 1911-12 shows that there were 31 registered pig insurance societies. The average number of pigs on which claims were paid was 160 and the average death rate percentage per annum 4.8, the average amount paid per pig that died £1 17s., and the average per pig insured 1s. 9d. The income from these societies slightly exceeded the expenditures, thus establishing a reserve fund for future use. There were also 832 unregistered pig clubs, having a total of 30,529 members and 53,981 pigs insured, the average annual death rate being 5.3 per cent. These societies are reported in satisfactory financial condition.

Provisions are made by which a small society which finds itself in financial stress by reason of continued outbreaks of diseases may reinsure through the larger cooperative insurance societies.

It is concluded that a society in normal condition would find it safe to insure its members' pigs at a rate of 2s. per market pig per annum and of 1s. per pig per annum for management expenses.

Agricultural associations of the Mohammedans of Maghreb, L. MILLIOT (*L'Association Agricole chez les Musulmans du Maghreb. Paris, 1912, pp. XVI+301*).—The author describes the influence of the character and religion of the Mohammedans upon the organization of agricultural associations in this district, and gives an extensive bibliography relating to agriculture and the various types of organizations.

The agricultural outlook (*U. S. Dept. Agr., Farmers' Bul.* 570 (1913), pp. 35).—The total farm value of all crops for 1913 is estimated at \$6,100,000,000, and the value of animals sold and slaughtered and of animal products at \$3,650,000,000.

Upon the assumption that 48 per cent of the crops and 80 per cent of the animal products are sold off the farm, the average farm income in cash is estimated as \$892. This estimate, as worked out for geographical divisions, is shown in the following table:

Estimated value of sales of crops and live-stock products in the United States in 1913.

Division.	Estimated value, in millions of dollars, of farm sales from 1913 crop.			Estimated value of total sales per farm.	Estimated total sales per capita of rural population (excluding towns).
	Crops.	Live-stock products.	Total.		
New England.....	\$186	\$374	\$560	\$834	\$100
South Atlantic.....	570	186	756	657	97
North Central, east.....	410	701	1,111	950	152
North Central, west.....	956	934	1,890	1,629	273
South Central.....	615	449	1,064	516	92
Western.....	191	275	466	1,195	155
United States.....	2,928	2,919	5,847	892	139

From a study of the total production and total values, it is pointed out that it does not necessarily follow that an increased production would result in an increase in cash income per farm or per capita of farm population, or that the price paid by the consumer would be any lower. The prices of the 14 principal crops averaged 20.2 per cent higher than a year ago and 4.6 per cent higher than two years ago; their total values averaged 3.8 and 7.6 per cent, respectively.

The first annual inquiry to determine what percentage of the apple crop is shipped out of the counties where grown showed that of the production for 1913, 41 per cent was shipped out and 59 per cent retained for local consumption.

Statistics are also given of the acreage, production, and value of farm crops, index figures of yield per acre of the principal farm crops, a brief statement of the foreign trade, and wages of farm labor. Statistical tables are included showing the estimated acreage, production, and value for 1912 and 1913 of the leading farm crops. The area and condition of winter wheat and rye are also noted.

[Agricultural statistics for Scotland], J. M. RAMSAY (*Agr. Statist. Scotland, 1 (1912), pts. 1, pp. 96; 2, pp. 97-168*).—Statistics for 1911-12 are given, showing by counties the acreage, production, and average yield of the principal field crops, the number of live stock, and the number of holdings by tenure. For Scotland as a whole the duration of the harvest, weight of grain per bushel, value of crops, and weather conditions for the year are discussed.

German agriculture (*Die Deutsche Landwirtschaft. Berlin, 1913, pp. 279, pls. 22, figs. 16*).—This report of the work of the Imperial Statistical Office describes and analyzes the statistics collected by the German Government that relate to agriculture. It is principally devoted to a discussion of the census of 1907 and of additional information from other sources relating to prices, live stock slaughtered, average yields, markets, etc.

Agricultural statistics (*Zeml. Statist. (Statist. Agr.), 1911, pp. 117*).—Data are given showing by arrondissements and departments the area and produc-

tion of the principal farm crops for 1911, and for Bulgaria as a whole for 1907-1911.

The evolution of agriculture in Spain, F. ESPINOSA (*Prog. Agr. y Pecuaria*, 19 (1913), Nos. 843, pp. 661-663; 845, pp. 695, 696; 846, pp. 709-711).—The author traces the history of agriculture in Spain, shows the influence of the Romans and Arabs, and gives the principal crops and the changes in the systems of cultivation for each period in its development.

Agricultural reform in Russia (*La Reforme Agraire en Russie*, St. Petersburg: Min. Agr., 1913, pp. [34], pls. 12).—This volume contains 24 tables and diagrams, with a text accompanying, to show the principal results obtained by the agrarian commissions between 1907 and 1911 in the reorganization of agriculture in Russia.

[Agriculture in Australia], G. H. KNIBBS (*Off. Yearbook Aust.*, 6 (1901-1912), pp. 265-444, figs. 6).—This section of the Australian Yearbook treats of land tenure and settlement and pastoral and agricultural production, and traces the history of agriculture in the various colonies from their early settlement to the present time. The text is fully illustrated by maps, diagrams, and statistical data.

[Agriculture in Korea] (*Ann. Rpt. Reforms and Prog. Chosen (Korea)*, 1911-12, pp. 149-167, pls. 4).—It is reported that the production of rice, wheat, barley, white beans, and native cotton increased more than 35 per cent between 1909 and 1911. In the same period the increase in cattle was 44 per cent. This increase in crops and cattle has been accompanied by an increase in quality, due to the use of improved stock and methods under the supervision of the Government.

AGRICULTURAL EDUCATION.

Agricultural sciences and education (*X. Cong. Internat. Agr. Gand*, 1913, Sect. 2, pp. [412], figs. 3).—This report consists of papers on agricultural science and education, submitted at the meeting of the second section of the Tenth International Congress of Agriculture, previously noted (*E. S. R.*, 29, p. 103).

Annual report on the distribution of grants for agricultural education and research in the year 1912-13 (*Bd. Agr. and Fisheries [London]*, *Ann. Rpt. Agr. Ed. and Research*, 1912-13, pp. XXV+137).—This report contains an account of the reorganization of agricultural education in England and Wales, adapting its administration to the new conditions now prevailing, and the following appendixes: (1) Lists of institutions receiving grants for agricultural education and research in 1912-13; (2) detailed reports on the organization and activities of the College of Agriculture and Horticulture at Holmes Chapel, Midland Agricultural and Dairy College, Kingston, Harris Institute, Preston, E. Anglian Institute of Agriculture, Chelmsford, and the Hampshire Farm School, Basing; (3) notes on work at research institutes; (4) notes on investigations aided by special research grants; (5) research scholarships in agricultural science; (6) staffs of state-aided institutions; (7) student statistics of state-aided institutions; (8) farm schools and farm institutes; (9) agricultural staffs of county councils; and (10) leaflets and journals and other miscellaneous publications of the board issued in 1912.

Information, regulations, instructions, and courses of study relating to agriculture and horticulture in continuation schools, high schools, and collegiate institutes (*Ontario Dept. Ed., Agr. Ed. Circ. 13 (1) (1913)*, pp. 15).—The plan under which the department of education of the Province of Ontario is cooperating with the department of agriculture to encourage instruction in

agriculture and horticulture in continuation and high schools and collegiate institutes is explained in detail. The instruction will be optional, under the supervision of the director of agricultural education, and will be given by teachers of science holding an intermediate certificate in agriculture and horticulture granted upon the satisfactory completion of two 5-weeks summer sessions at the Ontario Agricultural College, or by the district agricultural representatives. A board of trustees that provides and maintains satisfactorily a course in agriculture and horticulture in the lower school of the high school course extending over 2 years, including pupils' home projects under a certificated teacher, will receive \$100 and the teacher \$75. To the school board which, in addition to the home projects, provides and maintains experimental and demonstration plats at or in connection with the school for the practical instruction of the pupils, an additional grant not to exceed \$25 will be paid, and to the teacher an additional annual grant of \$25. When the work is conducted by a county agricultural representative he will be paid the grants specified for the teacher. The 2-year middle school course may be taken only in schools where the lower school course is being taken. The same grants will be paid and the same requirements as regards instruction and examinations made as in the lower school course.

The lower school course of study with suggested home projects and the middle school course are outlined. At least 2 hours a week during each of the 2 years of both lower and middle courses are to be devoted to this work.

Information, regulations, instructions, and course of study in elementary agriculture and horticulture for rural and village public and separate schools (Ontario Dept. Ed., Agr. Ed. Circ. 13, 1913, pp. 18).—The department of education is also cooperating with the department of agriculture of the Province of Ontario in introducing elementary agriculture and horticulture into the rural and village schools. The instruction is optional, under the general supervision of the director of elementary agricultural education, and given by teachers either not especially certificated, or holding special certificates in elementary agriculture and horticulture. These may be obtained on the completion of (1) a 10-weeks spring course at the Ontario Agricultural College, (2) 2 summer sessions at the college and a directed winter's reading course, and (3) a course in agriculture at a high school followed by a further course at the normal school and one summer session at the college. Besides the classroom instruction there will be practical work carried out either as a home gardening plan or as a school gardening plan. A rural or village school board which provides and maintains satisfactorily throughout the year a course in elementary agriculture and horticulture with supervised home gardens or projects and an uncertificated teacher may receive not to exceed \$8 for the trustees and \$15 for the teacher; with a certificated teacher not to exceed \$20 for the trustees and \$38 for the teacher. In addition, where a well-conducted school farm or garden of 6 square rods is maintained the grant may not exceed, with an uncertificated teacher, \$12 to the trustees and \$23 to the teacher; with a certificated teacher, \$30 to the trustees and \$57 to the teacher.

The course of study is outlined.

[Agricultural education in Brazil], P. DE TOLEDO (Relat. Min. Agr. Indus. e Com., Brazil, No. 1 (1912), pp. 5-59, pls. 14).—This is the report for 1912 by the minister of agriculture, industry, and commerce, including among other matters, the organization of agricultural instruction and research at the Higher School of Agriculture and Veterinary Medicine at Rio de Janeiro, 2 secondary or theoretical practical schools of agriculture, 8 agricultural apprentice schools, itinerant agricultural courses, 7 demonstration fields, 2 experiment stations, 2

sericultural stations, 3 zootechnical stations, 2 model breeding farms, a botanical garden, a national museum, and a forest nursery.

A teacher training school in gardening and manual training, E. KATZ (*Mitt. Deut. Landw. Gesell.*, 28 (1913), No. 25, pp. 367-369).—The author describes a private experiment begun in April, 1913, at the A. and F. Simon institution at Hanover, near Peine, in the training of teachers in gardening and manual training. The instruction is given in 2 half-year courses, comprising in the summer practical gardening 20 hours, woodworking 4, paste work 3, drawing 3, horticulture 4, chemistry 2, physics 2, political economy 2, and pedagogics 4 hours; and in the winter wood and metal work 24 hours, paste work 4, gardening 4, drawing 4, chemistry 2, physics 2, and methods 4 hours. The director is assisted by an experienced horticulturist and manual training instructor. The school has an area of 50 acres, 44 of which are planted to fruits and vegetables grown for profit.

The Massachusetts plan of secondary vocational agricultural education, R. W. STIMSON (*Business America*, 14 (1913), No. 5, pp. 451-457).—The author of this article is carrying out under the direction of the Massachusetts board of education a plan for the development of agricultural training of the grade below that of the college. The plan has a number of unique features. Principally it insists on a division of time about as follows: For the execution of the home projects, including work during vacations and other out-of-school hours, 50 per cent; and for the related study, 30 per cent. The remaining 20 per cent of the time of the boy is devoted to general culture and good citizenship instruction, wherein systematic courses may be provided in such subjects as English, history, civics, current events, and science.

Agricultural education through home projects: The Massachusetts plan, W. T. BAWDEN (*Vocational Ed.*, 3 (1913), No. 2, pp. 86-105, figs. 4).—This article deals with the observations, made by the author, of the work in agricultural education in some of the public high schools of Massachusetts. He considers that although there is a high per capita cost, agricultural education is really an investment, not an expense. The work is deemed practical, and the supervision of unusual efficiency, so that the outlook is encouraging.

Enthusing 20,000 young folks in rural life, E. H. FORBUSH (*New England Homestead*, 68 (1914), No. 1, pp. 3, 4, fig. 1).—This article deals with the growth of the boys' and girls' agricultural club movement in the State of Massachusetts. It is noted that the legislature of 1912 passed a bill appropriating \$200 to each incorporated agricultural society for children's and youth's premiums, and the 1913 legislature appropriated \$1,000 to be expended through the state board of agriculture for the promotion and development of state exhibits and contests.

Sixty lessons in agriculture, B. C. BUFFUM and D. C. DEEVER (*New York, Cincinnati, and Chicago*, [1913], pp. 272, pl. 1, figs. 164).—This book is intended for the sixth, seventh, and eighth grades, and as the treatment is not technical, can be used in schools whose teachers have had no special training in school agriculture. Almost every chapter closes with questions, practical exercises, and references to the farmers' bulletins of the U. S. Department of Agriculture.

A course of study in agriculture for high schools, W. P. EVANS (*Jefferson City, Mo.: State Dept. Ed.*, 1913, pp. 48).—This circular, containing a syllabus of a course in agriculture, lists of required equipment in laboratory and library, and general suggestions to teachers, has been prepared by the state department of education as a means to promote uniformity in equipment and course of study.

Elementary agriculture, W. L. NIDA (*Chicago* [1913], pp. VI+228+VII-XXXV, pl. 1, figs. 109).—This is a book for the fifth and sixth grades. It begins with animal life, describing the different breeds of farm stock and their usefulness, and subsequently takes up how to produce the best crops through the use of fertilizers, tillage, and rotation; how to distinguish between friends and foes in the insect and bird kingdoms; how to engage profitably in dairying, gardening, bee keeping, and poultry raising; and how to preserve the fruits of the harvest for winter use. There are special chapters on farm sanitation and country roads.

School gardening, L. B. HYDE, edited by T. W. SANDERS (*London*, 1913, pp. 104, pl. 1, figs. 68).—This is a simple book for teaching the rudiments of practical horticulture in a clear and concise form in the elementary schools. It gives directions for laying out plats, propagating and cultivating fruits, flowers and vegetables, and indoor school gardening. A series of typical questions on the contents is added.

Textiles—a handbook for the student and the consumer, MARY S. WOOLMAN and ELLEN B. MCGOWAN (*New York*, 1913, pp. XI+428, pl. 1, figs. 137).—This volume, which is intended "as a text-book for college classes or for study clubs and as a guide for the housekeeper or individual consumer of textiles and clothing, the teacher, the club woman, the saleswoman, and as an introductory survey of the subject for the student who contemplates professional work in the textile industries," is based upon the authors' experience in teaching textiles to college students. Such subjects are included as the beginning of the textile industries, spinning and weaving, woolen and worsted (raw materials and manufacture), cotton, silk, linen and minor fibers, consumer's judgment of textiles, microscopic and chemical study of textile fibers, dyeing of textile fibers, laundry notes, hygiene of clothing, some economic and social aspects, and clothing budgets. The volume contains a bibliography and glossary as well as an index.

The training of boys in cooking after leaving school, C. H. SENN (*Jour. Roy. Sanit. Inst.*, 34 (1913), No. 11, pp. 522-526).—The author outlines the qualifications of a chef and states how boys are trained to become cooks in England and France.

MISCELLANEOUS.

Twenty-sixth Annual Report of Indiana Station, 1913 (*Indiana Sta. Rpt.* 1913, pp. 88).—This contains the organization list, reports of the director and heads of departments, the experimental features of which are for the most part abstracted elsewhere in this issue, and a financial statement for the state funds for the fiscal year ended September 30, 1913, and for the remaining funds for the fiscal year ended June 30, 1913.

Twenty-second Annual Report of Oklahoma Station, 1913 (*Oklahoma Sta. Rpt.* 1913, pp. 112, figs. 18).—This contains the organization list, a brief report by the director, a financial statement for the fiscal year ended June 30, 1913, departmental reports, the experimental features of which are for the most part abstracted elsewhere in this issue, an article on The Poisoning of Cattle in the Pasture, noted on page 584, and reprints of Bulletin 95, section 2 of Bulletin 99, and Circular 15, all of which have been previously noted.

Twenty-fifth Annual Report of Rhode Island Station, 1912 (*Rhode Island Sta. Rpt.* 1912, pp. 185-241+VI).—This contains the organization list, a report of the director, including meteorological observations and notes on experimental work for the most part abstracted elsewhere in this issue, and a financial statement for the fiscal year ended June 30, 1912.

Twenty-sixth Annual Report of South Carolina Station, 1913 (*South Carolina Sta. Rpt. 1913, pp. 34*).—This contains the organization list, a report of the director on the work of the station, a financial statement for the fiscal year ended June 30, 1913, and departmental reports, of which those of the botanist and entomologist are abstracted elsewhere in this issue.

[**Annual Report of the Rothamsted Experimental Station, 1912**], E. J. RUSSELL (*Rothamsted Expt. Sta., Harpenden, Ann. Rpt. 1912, pp. 26*).—A progress report for the year.

Third report on the work of the Association of Austrian Experiment Stations for the year ended September 30, 1913 (*Ztschr. Landw. Versuchsw. Österr., 16 (1913), No. 10, pp. 985-1002*).—The work of these institutions is briefly summarized.

Agricultural report for Finland, 1911 (*Landtbr. Styr. Meddel. [Finland], No. 85 (1911), pp. 227*).—This report contains accounts of the meteorological and crop conditions in Finland and of the activities of the various state educational and administrative agencies for the advancement of Finnish agriculture during the year. Summarized reports of the agricultural experiment station at Aunäs, the agricultural laboratories at Helsingfors, Vasa, and Viborg, and of the seed control stations at Viborg and Björneborg are also included.

The work of the Dominion Experimental Farms, F. T. SHUTT (*Trans. Canad. Inst., 10 (1913), I, No. 23, pp. 17-40*).—An account of the history and work of these farms is given.

The development of the Möckern Experiment Station under the direction of O. Kellner, J. Volhard (*Landw. Vers. Stat., 79-80 (1913), pp. 903-922*).—A descriptive account is given.

The annual register of agricultural experiments with full abstracts, 1913, edited by J. W. HURST (*Ann. Reg. Agr. Expts. [London], 1913, pp. 125*).—This publication contains brief résumés of experimental work conducted in England, Scotland, and Ireland. A list of new seeds and plants is appended.

Report of the Conservation Commission of the State of California, 1912 (*Rpt. Conserv. Com. Cal., 1912, pp. VIII+502, pls. 13, figs. 35*).—This is a comprehensive report dealing especially with forestry, irrigation, and the water resources of California. The data pertaining to irrigation have been previously noted (E. S. R., 29, p. 588).

Agricultural laws of Missouri (*Missouri Bd. Agr. Mo. Bul., 11 (1913), No. 5, pp. 35*).—The text of these laws, including those enacted in 1913, is given.

The use of the theory of errors in agriculture and forestry, B. BAULE (*Fühling's Landw. Ztg., 62 (1913), No. 24, pp. 852-866, fig. 1*).—This article deals at some length with methods of estimating the probable errors in experimental work of various kinds in agriculture and forestry.

NOTES.

Hawaii Federal Station.—At the last session of the territorial legislature an appropriation was made available to the station to be used in improving the marketing conditions for local farm produce. The territorial market division was established under its supervision, and while the produce sent in during the first month amounted in value to only \$84, shipments have rapidly increased, amounting in February to \$2,200 and in March to \$4,200. An unusually keen interest is being taken in this experiment. The territorial market makes available a larger market than had ever been open to the local farmer and at considerably better prices. Among the results of its establishment may be noted the greatly increased plantings of miscellaneous farm produce and the extension of poultry and hog raising.

Kansas College and Station.—President H. J. Waters has been granted leave of absence to make an inspection of the bureaus of education and agriculture in the Philippine Islands, and will subsequently visit China, India, Egypt, and other countries, returning about October 1. Dr. J. T. Willard has been designated acting president during this period.

Stanley Clark has been appointed superintendent of the new substation at Colby where wells are being drilled and irrigation and dry-land farming operations being begun. Malcomb C. Sewell, formerly assistant in soils at the Ohio State University, has been appointed superintendent of the Garden City substation. Both appointments became effective March 1.

Kentucky Station.—Dr. L. W. McElyea, of the hog cholera serum administration work, resigned February 1 and has been succeeded by Dr. R. L. Pontius. H. W. Rickey has been appointed poultry expert to organize boys' and girls' poultry clubs. G. C. Routt, assistant in animal husbandry, resigned April 1.

Michigan Station.—Arthur K. Hart has resigned as assistant chemist and has been succeeded by J. H. Torrence, a 1913 graduate of the University of Arkansas.

Nebraska University.—The department of agricultural engineering is to give a 6 weeks' course in steam and gasoline engines and automobiles beginning about June 8. A rural ministers' short course is to be held at the university farm June 11-16.

North Carolina Station.—F. E. Carruth, a graduate of Wesleyan University, has been appointed assistant chemist and has entered upon his duties.

Oregon College and Station.—Dean A. B. Cordley, of the school of agriculture, has been appointed director of the station.

Clemson College and Station.—The extension division has just finished conducting agricultural rallies in 132 public schools in the State. Each of these schools has a 3-acre demonstration plat and is teaching agriculture under the direction of the college.

The station has purchased a pure-bred Percheron stallion and a pure-bred Hereford bull for use with the native stock.

Paul H. Calvin, a graduate in animal husbandry of Purdue University, has been appointed a live stock demonstration agent.

Wisconsin University and Station.—W. H. Strowd, assistant chemist at the North Carolina Station has been appointed chemist in charge of the feed and fertilizer control.

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VOL. XXX.

MAY, 1914.

No. 7.

No better evidence is needed of the place which agricultural education has attained in the public mind than the passage by Congress of the extension measure signed by the President on May 8. It will be recognized as a highly significant step in the advancement of the great national industry through the aid of the General Government, rounding out and completing the movement inaugurated in 1862 with the passage of the land-grant act for the establishment of agricultural colleges. Since that radical step was taken, which settled the right of the Federal Government to aid education in the States, the national attitude toward direct appropriations for agriculture has undergone a complete change.

This new measure is the sixth act which recognizes agriculture as an appropriate subject for promotion by the Federal Government, and the fifth to provide permanent grants from the public Treasury to be used through the system of state institutions established by the Morrill land-grant of 1862. If the recognition of agriculture as a subject for national aid and attention has seemed tardy, it has been none the less emphatic, and in this last instance it represents a far wider expression of favor than any previous measure of the sort. The welfare of agriculture, even to the point of considering the individual farmer and farm home, has become a matter of national concern, limited by no state boundaries.

The passage of the Extension Act was a response to a widespread public demand, more so than any of the previous acts. Advocacy of it came not alone from a group of educational institutions which conceived the plan and would be the beneficiaries under it; but in an unusual degree it came as an intelligent expression of farmers through their organizations, and from the various agencies which stand close to them, such as the bankers and the railroads, commercial clubs and related bodies, and welfare organizations generally. It thus expresses, probably more emphatically than any previous national action, the very general realization of the fundamental relation of agriculture and of the people living under it to the welfare and prosperity of the whole country. Else, why should the nation

bind itself to an annual appropriation which will soon reach beyond \$4,500,000, and the States in accepting it agree to practically duplicate the amount for a like purpose? It is not a sop to the farmers. It is the mature expression of a national policy. It is for the improvement of the country's greatest industry, that the national resources may be made more productive and conserved for the benefit of posterity.

The Smith-Lever Act, as the extension measure just enacted seems destined to be known, completes a campaign of education extending over several years. Its inception may perhaps be traced to the report of a committee on extension work of the Association of American Agricultural Colleges and Experiment Stations in 1906. This committee, as the result of an inquiry into the status of agricultural extension teaching, found three hundred and seventeen agencies, including thirty-eight agricultural colleges and experiment stations, then engaged in some form of extension work, mainly farmers' institutes. It recommended that each agricultural college organize as soon as practicable a department in extension teaching in agriculture, coordinate with other departments or divisions.

This recommendation was repeated in 1907 and 1908, and in the latter year the committee also advocated "that the Association place itself on record in favor of a moderate federal appropriation to be made to the land-grant colleges for the purpose of carrying on extension work in agriculture under a plan which requires the States also to make appropriations for the work."

At the Portland meeting of the Association in 1909, the same committee reported a detailed plan for federal aid. This plan included an annual appropriation of \$10,000 to the land-grant college of each State and Territory for extension work in agriculture, domestic science, and other phases of rural life. This initial appropriation was to be supplemented after two years by annual grants, equal to those made by the respective state legislatures, but not to exceed one cent per capita of the total population of the State or Territory.

A bill embodying these ideas was introduced into the House of Representatives December 15, 1909, by Hon. J. C. McLaughlin of Michigan. No action was taken on this measure in either House of Congress, although in the following June a bill providing for co-operation with the States in vocational education was favorably reported from the Senate Committee on Agriculture and Forestry, in which an appropriation was included for extension departments in the land-grant colleges under a plan differing from the McLaughlin Bill in numerous important details.

Meanwhile, the extension idea was widely propagated and found many advocates among public men. Demonstration work had been

organized in the South, several States largely developed their activities in extension, an organization of business interests was formed to promote national legislation, and private funds began to be contributed for conducting extension campaigns among farmers through meetings and demonstrations. The agencies multiplied and the sentiment for such a nation-wide movement developed with marked rapidity. The exploitation of the work of the experiment stations, their disclosures of the inefficient, uneconomic and wasteful practices often followed, and the presentation of statistics of farm conditions, enforced the conviction that agriculture was not keeping pace with modern progress and that added means were indispensable for reaching and influencing the mass of farmers on the land.

The opening of the Sixty-second Congress brought a number of bills proposing aid for extension work. Among these was the Lever Bill, introduced by Hon. A. F. Lever of South Carolina, June 12, 1911, and the McKinley Bill, introduced by Hon. W. B. McKinley of Illinois, August 10. Subsequently the Smith-Lever Bill was drawn up and introduced by Hon. Hoke Smith of Georgia into the Senate and by Mr. Lever into the House in January, 1912. This measure was eventually modified in some respects and passed by the House in August. It came before the Senate in December, but on January 31, 1913, after extended consideration, that body substituted for it a much more comprehensive bill for vocational education and no agreement was reached between the two Houses before adjournment.

Substantially the original Smith-Lever Bill was reintroduced into the Sixty-third Congress April 7, 1913, and on September 6, its sponsors so modified its provisions as to provide for cooperative extension work between the agricultural colleges and this Department. This measure, with some further amendments, passed the House January 19, 1914, and the Senate February 7. After several months in conference the report of the conferees was agreed to, and on May 8, as previously stated, it received the signature of President Wilson. It goes into effect, therefore, on July 1, 1914, less than five years from the time the movement for such a measure was inaugurated in Congress.

In its final form the Act provides that "in order to aid in diffusing among the people of the United States useful and practical information on subjects relating to agriculture and home economics and to encourage the application of the same," there may be inaugurated in connection with the colleges receiving federal aid under the Morrill acts, agricultural extension work to be carried on in cooperation with this Department. This work is to consist of "the giving of instruction and practical demonstrations in agriculture and home economics to persons not attending or resident in said colleges in the several

communities, and imparting to such persons information on said subjects through field demonstrations, publications, and otherwise."

For the maintenance of the work there is permanently appropriated \$480,000 per annum, or \$10,000 for each State which accepts the provisions of the Act. In addition, there is appropriated \$600,000 for the second fiscal year of its operation, and for each year thereafter for seven years \$500,000 additional, until a total of \$4,100,000 is reached, which with the \$480,000 makes a total of \$4,580,000, and continues as a permanent annual appropriation. Unlike the initial appropriation of \$480,000, these additional appropriations are to be allotted annually to each State by the Secretary of Agriculture in the proportion which its rural population bears to the total rural population. They are also conditional upon the provision by the States of an equal sum for maintenance of the work, supplied either by direct appropriation, or contributions from the county, college, or local authorities, or from individuals within the State.

The Act further provides that the extension work authorized is to be carried on in such manner as may be mutually agreed upon by the Secretary of Agriculture and the colleges. Before the funds appropriated become available, plans for the work must be submitted to the Secretary and receive his approval.

In its provisions as to care of funds, etc., the Act follows in a general way the language of previous legislation for the agricultural colleges and experiment stations. It is specified that in States where there are two or more colleges receiving the benefits of the Morrill acts, the legislatures shall designate the institutions to receive the appropriations. No part of the appropriation can be used in the purchase, erection, or repair of buildings, the purchase or rental of land, college course teaching, promoting agricultural trains, or other purposes not specifically authorized, and not more than five per cent for the printing and distribution of publications. Payments from the federal Treasury are to be made semiannually on January 1 and July 1, and a financial report thereon must be submitted prior to September 1. A full report of operations under the Act is also required prior to January 1 from the several colleges, while the Secretary of Agriculture in turn must make an annual report to Congress.

In one respect the measure is unusually broad as compared with the legislation which preceded it. In addition to the assistance given specifically to agriculture, it recognizes the home and home maker, and the general conditions of country living. It is probably the first federal legislation to be adopted in which the term "home economics" formally appears. It is, therefore, a recognition not only of the American farmer but of the American home maker and of the worth and dignity of the vocations which they represent.

It will be noted that the Extension Act provides for cooperative action between the General Government and the States, between the Federal Department of Agriculture as representing one agency and the agricultural colleges as representing the other. For the pressure for extension activities has not been confined to the colleges in the States, but has been felt in increasing degree by the Department of Agriculture at Washington, and Congress has seen fit to appropriate moneys for demonstration work to be used in the States through the Department.

The Department and the colleges, with their experiment stations, constitute the two great agencies for acquiring agricultural information. There are many minor contributory agencies which are not to be overlooked, but they are independent and incidental rather than primary. The Department, working on broad lines and problems, frequently not bounded by a State but regional, works out matters which it is desirable to get before the people, or leads up to a campaign which it is in the interest of the States to have conducted. The individual stations likewise make discoveries which are of both state and regional application, and they also work out details for local conditions, sometimes covering an entire State, sometimes much more restricted.

These results and applications, whatever their source, deserve to be brought to the attention of the public, and this makes desirable some organized action. The new extension measure provides the colleges with the means for this and also provides for cooperation. The funds carried in the Smith-Lever Act are not appropriated directly to the Department of Agriculture as its funds to dispense among the States, and they are not given to the States unconditionally. They are designed "to provide for cooperative agricultural extension work between the agricultural colleges in the several States . . . and the United States Department of Agriculture." The Department receives no portion of the funds appropriated under the Extension Act, but these are paid semiannually to the state authorities on the warrant of the Secretary of Agriculture, who is charged with the proper administration of the law. The plan of organization at the colleges contemplates the establishment of extension divisions at each of the colleges. Into these all the extension funds and work will be grouped, just as those for experimentation and research are grouped in the experiment stations. These extension divisions are state organizations and not federal, and the funds supplied under the new act become the funds of the designated college, subject to certain conditions and to a measure of federal control.

On the other hand, the Department has separate funds appropriated to it by Congress for extension (demonstration) work to be con-

ducted in the States. The most conspicuous examples are those for the cooperative demonstration work in the South which originally grew out of the ravages of the boll weevil, and demonstration work in the northern States which was an offshoot of the farm management studies. These two funds, together with other contributions to be used with them, amount to approximately \$800,000. In addition there are other funds, portions of special appropriations, which are employed in demonstration and extension activities.

Heretofore the Department's demonstration work has been conducted in part independently of the agricultural colleges. No uniform plan has been followed, and the varied activities in extension lines have not been definitely brought together and administered through one departmental agency. Such an administrative agency has now been established, through a States Relations Committee, and to it will also be assigned the general administration and supervision of the new extension fund under the Smith-Lever Act. There will thus be for the first time a single central agency in the Department which will deal with the extension work of the Department and with the extension divisions of the several colleges. The Department now proposes to make the agricultural colleges state centers of all its demonstration and other extension work, to be conducted in cooperation with the state institution. It will be united in the closest manner feasible with the state activities, so as to secure unity of action under a consolidated state organization. It is felt that such a combining and coordinating of these efforts will materially strengthen the conduct and the effectiveness of the undertaking as a whole.

Cooperation between the Department and the agricultural colleges has been discussed in an abstract way for a long time, and there have been many instances of such cooperation covering a wide range of subjects. There is now, however, an opportunity for cooperation on a national scale along the broad and varied lines of extension work in agriculture and home economics. This should be improved by devising and putting into operation an effective system which, while carefully preserving the autonomy and special responsibilities of each party, will bring the state and federal agencies for the betterment of agriculture and the practical education of the people on our farms into such close and harmonious relations as will best procure the economical and efficient use of the great sums of the people's money devoted to these purposes, and create an American system of extension service for our rural communities more widespread and beneficial in its operation than anything in this line the world has yet known.

To do this it will be the Department's aim to make the system cooperative in the best and most liberal sense,—a joint effort providing for cooperative planning, while entrusting to the extension departments of the colleges the details of execution, in accordance

with project agreements drawn to suit the varied requirements of different lines of work.

The more strictly cooperative work will usually involve only the Department's funds and such part of the Smith-Lever fund or state funds as the colleges may choose to put into the cooperative arrangement. The cooperation under the Smith-Lever Act will simply consist in the submission by the colleges of their projects to the Department for approval in advance, much as are the Adams fund projects, unless the college shall decide to use the Smith-Lever fund in whole or in part on projects which also involve the use of the Department's funds. State funds which the colleges may have for extension work outside the Smith-Lever projects and joint enterprises with the Department will of course be entirely within the control of the colleges, but it is hoped that even these funds will be so used through the Extension Divisions that there will be proper coordination of effort and avoidance of duplication all along the line of the institution's extension activities.

The inauguration of agricultural extension on the present broad basis is a tribute to the native intelligence of the American farmer. It recognizes his readiness for it and his ability to profit by it. A movement along the proposed lines would have been impractical under other conditions. It will aim confidently at putting into practice methods and ideas which are new to him and which require a high degree of intelligence to carry out.

There is a progressiveness in the American farmer and an adaptability when properly aroused which makes possible radical changes requiring a breaking away from tradition and custom. He needs to be shown and convinced, and when his confidence is won he is an apt pupil. He is capable of the highest type of farming, and of carrying out practices in irrigation, in seed improvement, in soil renovation, in dairy sanitation, and in many other lines which it would be useless to attempt to inculcate in the agriculture of many lands.

One very striking and tangible result of the agricultural work of the past quarter century has been the effect on the average American farmer, winning his confidence, broadening his vision, and making him more receptive of new ideas and more ready to change. As a matter of fact, very many radical and widespread changes of practice have already resulted, which have now become so generally accepted that they no longer excite comment except where comparison is presented. This is a remarkable achievement, worth all it has cost, and it has paved the way for the present extension propaganda.

The fear has been expressed that the experiment stations might suffer from the popularity of extension work, that attention would be diverted from them and from the need of their further support.

Instead, this Act gives more definite purpose and force to their work, and emphasizes its necessity in the development of agricultural practice. It is rooted in their activities and will be sustained by them. Without them it would soon suffer the fate of the old-style farmers' institutes.

The new work will make enlarged demands upon the stations and bring them closer to the people. While it may at times overshadow them somewhat in the popular mind, it will add a vast army of workers to their clientele, who will realize their ultimate dependence on experimentation and research, and who will be in closer touch with the people than any similar body of men and women yet organized. They will therefore be in the best position to popularize and advocate the work of the experiment stations.

In thus seeking to promote the general welfare by a comprehensive and permanent system of extension work on the farm and in the home, the Federal Government becomes an active cooperator in the campaign for rural development and progress which has made such remarkable headway within recent years. For it is within a comparatively short period that the responsibilities of American civilization as a whole to the open country have become fully appreciated.

Less than seven years ago, the holding of a conference by the Massachusetts Agricultural College for the momentary bringing together of the varied forces making for rural progress—educational, social, religious, as well as distinctively agricultural—was regarded as a novel and suggestive departure from the prevailing conception of agriculture as an isolated industry and its welfare as a matter of comparatively remote general significance. In 1909, after the holding of similar sectional conferences in New England and elsewhere, the appointment of the National Commission on Country Life and similar related bodies, and the inauguration of some form of extension work in nearly every State, we find the committee on extension work of the Association of American Agricultural Colleges and Experiment Stations reporting that even "the various institutions engaged in work in behalf of our agricultural industry or rural people have labored very much by themselves. There has been a very slight measure of cooperation between rural church, country school, grange, club, agricultural college, and library." Still less, of course, was this cooperation in evidence as between agricultural and nonagricultural organizations.

As an example of the changing point of view in this respect may be cited the conferences on country life development held at Louisville, Kentucky, April 7-10, 1914. These conferences were sponsored by purely educational agencies, constituting the seventeenth annual

session of the conference for education in the South, and were in close cooperation with the Southern Educational Association, while the running expenses were defrayed by the Southern Education Board. The announced purpose of the gathering was not primarily pedagogic, as might have been expected, but to devise ways and means for all who are interested to organize and build up country life in the South. Its scope included conferences for farmers, business men, country women, boys and girls, ministers, physicians, and editors, as well as school workers, on special phases of the problem, together with general sessions in which all the groups met together for the consideration of the manifold matters which were found to be of common interest.

The conferences were noteworthy for emphasis placed upon the demonstration method and the use of illustrative material. Formal organizations for cooperative stock breeding and selling and the marketing of farm products and boys' and girls' clubs were effected from among those present, and programs carried out to show their practical workings. There was a government parcel post exhibit with experts from this Department to give advice as to the possibilities of this new service, the proper packing of goods, and ways and means to realize its full possibilities. The Kentucky State University had on exhibition a model home, equipped with modern conveniences, and offered lectures and demonstrations on home economics and rural sanitation. There was also a country school of modern type, a cooperative creamery, a model poultry plant, and a wealth of similar illustrative material.

None the less, perhaps the most valuable demonstration of all was that of the spirit of cooperation and good will toward agriculture, and the acknowledgment of its predominating importance in national life, manifested by the various and seemingly diverse agencies which shared the labors of the conferences and participated in their benefits. In their conception and development, the Louisville meetings reflected in no small degree the spirit of the times, and go far to explain why state and national governments are undertaking a great, permanent system of agricultural extension work.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

A short handbook on the carbohydrates, B. TOLLENS (*Kurzes Handbuch der Kohlenhydrate. Leipsic, 1914, 3. ed., pp. XX+816, figs. 30*).—In this edition of this well-known, authoritative handbook parts 1 and 2 have been combined. The book, while not dealing with everything that has been done in the realm of carbohydrate chemistry, contains the most important data which have accumulated in this field of study, and considers both its scientific and technical aspects.

Industrial and manufacturing chemistry: Organic, G. MARTIN ET AL. (*London, 1913, pp. XX+726, pls. 4, figs. 253*).—This book deals with the methods of manufacture and analysis in use in the following industries: Oil, fat, varnish, soap, wax, enamel, oilcloth, linoleum, milk, butter, cheese, casein, condensed milk and milk powders, margarin, fatty acids and candle-making materials, glycerol, essential oil, synthetic perfume, sugar, glucose, dextrose, invert sugar, honey, starch, dextrin, cellulose, wood and timber preservation, paper making, mercerization, collodion, artificial silk, wine and beer making, spirits and industrial alcohol, vinegar, lactic acid, butyric acid, charcoal and wood-distilling, turpentine and rosin, camphor, industrial gums and resins, rubber, oxalic acid, formic acid, tartaric acid, aldehydes, alcohols, esters and fruit essences, illuminating gas, coal tar and coal-tar products, synthetic coloring matters, natural dyestuffs, ink, paint and pigments, textile fibers, bleaching and water-proofing, dyeing and color-printing, leather and tanning, glue, gelatin, albumin, modern synthetic and other drugs, modern explosives, and photographic chemicals.

The ferments and their action, C. OPPENHEIMER (*Die Fermente und ihre Wirkungen. Leipsic, 1913, 4. rev. ed., vols. 1, pp. VIII+485; 2, pp. VIII+487-1150*).—The previous edition of the first volume has been noted (E. S. R., 22, p. 608). The second volume has been entirely rewritten, and contains an additional chapter, of 158 pages, on the physical chemistry of enzymes and enzym action, by R. O. Herzog.

The presence of some benzene derivatives in soils, E. C. SHOREY (*U. S. Dept. Agr., Jour. Agr. Research, 1 (1914), No. 5, pp. 357-363*).—Three aromatic compounds, namely, benzoic acid, metaoxytoluic acid, and vanillin, were isolated from samples of sandy Florida soils. The soils were composed of quartz sand ranging in color from light gray to brown, contained very little organic matter, and were devoted to orange culture. The organic matter is deposited as a thin layer on the grains of sand, and if the soil is treated with dilute alkali, it is dissolved away and pure white quartz sand remains.

Benzoic acid was isolated from a subsoil and there were no indications to show that it might be present in the corresponding surface soil. Metaoxytoluic acid was obtained in quantity only from subsoils. "The compound ob-

tained from the soil has the properties of metaoxytoluic acid, with the carboxyl, hydroxyl, and methyl radicals in the 1. 3. 5. positions, respectively. . . . Metaoxytoluic acid was made from sulphotoluic acid according to the method of Jacobsen, and its properties were compared with the compound obtained from the soil, the two agreeing in every respect." Vanillin was isolated and the amount present, as noted by the Folin and Denis method (E. S. R., 28, p. 807), was determined. "Sample No. 1 gave 0.001 per cent of vanillin, or 10 parts per million, while sample No. 2 showed 0.00048 per cent, or 4.8 parts per million."

In some previous work (E. S. R., 24, p. 524) it was shown that the methoxyl radical was present in many soils and could be determined by the Zeisel method. "A determination of the methoxyl in samples Nos. 1 and 2 by this method gave, for sample No. 1, 0.065 per cent of methoxyl calculated to vanillin, and for sample No. 2, 0.05 per cent." As the quantity of vanillin calculated was very much in excess of that isolated from an alkaline extract or that indicated by the Folin and Denis method it is probable that a considerable portion of it originates from compounds other than vanillin.

Of the three substances isolated, only benzoic acid and vanillin are naturally occurring products. The three substances, however, may be derived from, or transformed into one another. The preparation of metaoxytoluic acid in the laboratory does not suggest any process by which it may be formed in the soil from plant products or other compounds known to occur in soils. "Using the maximum figures for quantities obtained in these investigations and calculating to the acre-foot of soil, the following approximate quantities are obtained: Benzoic acid, 350 lbs.; metaoxytoluic acid, 800 lbs.; and vanillin, 40 lbs. to the acre-foot. In the case of the two acids the method involved considerable loss of material and the actual quantity present in the soil is undoubtedly in excess of these figures.

"The question as to the form in which these compounds exist in the soil is one deserving some consideration, although one not easily answered satisfactorily. It is true of most organic compounds that have been obtained from soils through extraction with dilute alkali that they are not readily obtained as such by water extraction of the soil. In many soils this can be explained, in part at least, by the fact that much of the organic matter in soils is of a resinous nature wholly insoluble in water, and compounds which when separated are easily soluble in water are so incased or protected by the resinous or varnishlike coating effected by this resinous material that they are very slowly dissolved, if at all, when the soil is leached. This effect is quite apart from any absorptive effect and is quite marked in extreme types, such as the sands of Florida and some peats, where either fine grinding or previous treatment with alcohol will render soluble in water organic material that before this treatment was so little soluble as to escape notice."

The methods utilized in the study are given in detail and are discussed.

The mineral elements contained in the casein of milk, L. LINDET (*Orig. Commun.* 8. *Internat. Cong. Appl. Chem.* [Washington and New York], 19 (1912), *Sect. VIII*d, pp. 199–207; *Compt. Rend. Acad. Sci.* [Paris], 155 (1912), No. 19, pp. 923, 924; *abs. in Zentbl. Biochem. u. Biophys.*, 14 (1913), No. 17–18, p. 615).—In this paper it is shown that only about half of the phosphorus contained in casein and obtained by precipitation with rennet is present as a calcium phosphate (probably a tricalcium phosphate), and that the remainder is present as a phosphoric acid compound of casein which is easily hydrolyzed with an alkali. Three-fifths of the calcium is bound to the phosphoric acid and the remaining two-fifths to the casein.

The rye flours of commerce and their chemical examination, K. HARTL (*Kísérlet. Közlem.*, 16 (1913), No. 5, pp. 613-638).—The need for standards in Hungary for rye flour such as exist for wheat is pointed out. A modified Weender crude fiber method is described and a comparative study with it and other methods is recommended, especially with brans and feeding stuffs. As the commercial value of wheat and rye flours rises with the whiteness of these flours, it is recommended that the pekarization test and ash determinations be made for grading the flours, and that in critical cases the degree of fineness be estimated according to the method described.

Unification of the methods of wine analysis (*Informateur*, 5 (1912), No. 43, pp. 262-266; *abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases*, 3 (1912), No. 8, pp. 1866-1868).—This states the results of a meeting of the International Committee of the Trade in Wine, Ciders, Spirits, and Liquors held for the purpose of obtaining uniform methods of analysis.

Report of the experimental-chemical and pure yeast laboratory of the Royal Institute for Wine Manufacture and Fruit Culture at Klosterneuburg (*Programm u. Jahresber. K. K. Höh. Lehranst. Wein u. Obstbau Klosterneuburg*, 1912-13, pp. 103-159).—A description of the work done by this laboratory during the year 1912, including the results of analyzing grape and other fruit wines prepared by various procedures; notes on the changes taking place during the fermentation of wine, the use of pure culture yeast for fermenting must from grapes infected with fungi, the refermentation of wines, and the effect of pure nitrogen, chloroform, and mustard oil on must and wine; and a comparative study of the Barth and Haas and Halenke and Möslinger methods for determining tartaric acid in the absence and presence of citric acid, decolorizing tests, etc.

Experiments in vinification, L. A. MUSSO (*Agr. Gaz. N. S. Wales*, 24 (1913), No. 5, pp. 407-415, pls. 3).—The purpose of these experiments was to find out (1) "at what stage, at what intervals, and in what quantity sulphurous acid is required to prevent the temperature of the must rising above the critical point; (2) to ascertain the effects of the addition of tartaric acid in various proportions to the must prior to fermentation; and (3) to ascertain the effects of the treatment with sulphurous acid conjointly with the addition of tartaric acid. . . .

"In using sulphurous acid for the purpose of checking the rapidity with which fermentation tends to take place, very good results can be obtained by adding an amount of 7 to 8 oz. of potassium metabisulphite per 200 gal. of must at the moment at which, fermentation having already started, there is a tendency to an excessive rise in temperature. The temperature of the must at the beginning should be a guide for the vine grower; the higher the initial temperature the sooner the metabisulphite should be added to the must."

Tartaric acid had no delaying influence on the fermentation itself, which is contrary to some other experiments which were conducted by the author on a small scale. It probably has the property of stimulating the activity of the yeast and offsetting particularly the retarding effect of sulphurous acid.

Crystalline deposits in wines, L. MATHIEU (*Jour. Agr. Prat.*, n. ser., 25 (1913), No. 8, pp. 240, 241).—This deals with the deposition of cream of tartar, especially by wines which were cooled and stored. Precipitation can also take place during the fermentation process, and a deposit of this substance in wine does not indicate that the wine has been treated with tartrates.

Tests in regard to the storage of apple residues (*Ber. Grossh. Bad. Landw. Vers. Anst. Augustenb.*, 1912, pp. 80, 81).—A study was made of the Scheurlen method, which consists of pressing the fruit residues in casks and interposing a layer of salt between each stratum when it attains a size of 20

to 30 cm. In the experiments two of the casks received no additions of salt, another received 2 per cent of salt, and another 3 per cent. After storage for about 2 months samples were withdrawn from each and the alcohol and volatile acids determined.

The casks with no salt showed, respectively, 2.13 and 2.18 per cent of alcohol and 0.08 and 0.05 per cent of volatile acids calculated on the basis of the fresh substance; the cask with 2 per cent of salt 3.47 per cent alcohol and 0.08 per cent acid; and the cask with 3 per cent of salt 2.93 per cent alcohol and 0.12 per cent acid. The losses in dry substance were very variable and no definite conclusion could be drawn. Drying the residue seems to be a better procedure for conserving it.

These products were relished by steers and swine, but it is recommended that only small amounts be fed at a time on account of the high alcohol content.

Some further notes in regard to the drying of potatoes damaged by frost and rot, REHFELD and MÜLLER (*Jahrb. Ver. Spiritus Fabrik. Deut.*, 13 (1913), pp. 437-466; *abs. in Chem. Ztg.*, 37 (1913), No. 34, p. 346).—In working up potatoes of this character it was found that the efficiency of the drying machinery was 30 per cent lower than usual. Difficulties were experienced in maintaining proper temperatures because of certain chemical changes in the carbohydrate material. Potatoes which came directly from the field were more easily worked than stored potatoes. One of the most disturbing factors was dirt, of which the amount contained in this class of goods was from 32 to 34 per cent. More fuel was necessary for drying this kind of material.

The significance of potato foliage drying with reference to the installation of potato-drying apparatus, VÖLTZ (*Jahrb. Ver. Spiritus Fabrik. Deut.*, 13 (1913), pp. 466-487; *abs. in Chem. Ztg.*, 37 (1913), No. 34, p. 346).—Feeding (balance) experiments were conducted by the author and his associates with sheep on the foliage of two varieties of potatoes.

The results show that potato foliage from the standpoint of nutritive value can be closely compared with good meadow hay. The digestibility of the potato berry was somewhat less than the foliage but toxic effects were never noted.

As the feed value of the potato leaf is high, it is believed that artificial drying by appropriate apparatus is both feasible and profitable, although when favorable weather exists open-air drying can also be used. Storing by pickling (Einsäuerung) involves a loss of about 40 per cent of the organic digestible material and about 12 per cent of crude protein. Some of the nitrogen-containing substances are transformed into sodium nitrate but this salt is of no value for feeding Herbivora.

Cassava roots and their by-products, M. KLING (*Landw. Vers. Stat.*, 82 (1913), No. 3-4, pp. 211-236).—Fresh cassava roots, when shipped, spoil very easily. This results in a blackening of the roots, and consequently they lose their value as a raw material for preparing the tapioca flour used for human consumption. When the tapioca factory is not in a locality where the roots are grown, the fresh roots, after being washed and sometimes peeled, are dried in the sun. The material prepared in this manner can not be used for the manufacture of the usual tapioca starch flour but it can be made into flour which can be used for other technical purposes. Certain firms which work up *Manihot utilissima* by two methods, wet and dry, sell the by-products as starch feed meal, feed meal, and starch slops.

This article gives the results of comparatively complete analyses of these and similar products, compares the figures obtained with pressed potatoes, and discusses their value for feeding stock.

American commercial methods of manufacturing preserves, pickles, canned foods, etc., C. A. SHINKLE (*Menominee, Mich.*, 1912, rev. ed., pp. 221,

figs. 16).—This is a detailed description of methods for preparing conserved or canned goods. The first portion of the book is devoted to the making of pickles, sauces, and vinegars; the second to preserves, jams, jellies, fruit butters, etc., and the equipment required therefor; and the third to the actual processes as carried out in the canneries. A final section is devoted to the cost of producing canned goods. Some illustrations of machinery are shown.

Modern cane sirup making, W. G. TAGGART (*La. Planter*, 50 (1913), No. 10, pp. 160, 161).—A discussion of the factors which go to make up a good cane sirup.

“Clarification is without doubt the most important factor influencing the quality of sirups, and good clarification can only be produced by the use of sulphur and lime. . . . There are two other chemicals, phosphoric acid and hydrosulphites, which are more or less used to aid lime and sulphur in the process of clarification. . . . Rust is very often to blame for the poor grade of sirup which is turned out during the first few days of a campaign. All iron open kettles or evaporators in which sirup is to be boiled should be kept thoroughly enameled. Sirup boiled in contact with iron becomes dark and will not command a good price.”

The production of beet sugar in a continental factory, R. N. DOWLING (*Jour. Bd. Agr. [London]*, 18 (1912), No. 12, pp. 1005–1014, pls. 2).—This is a description of the methods prevailing on the European continent and deals with delivery, weighing, and sampling of beet roots, the disposal of the roots at the factory, washing, weighing, the extraction of the sugar by the diffusion process, purification of the beet juice, waste waters, the “Steffen” process, heat in the factory, labor, and cost of working and delivering beet roots per ton.

Storing of beet chips with lactic acid ferments, A. ZAITSCHEK (*Österr. Ungar. Ztschr. Zuckerindus. u. Landw.*, 42 (1913), No. 1, pp. 1–8; *abs. in Chem. Ztg.*, 37 (1913), No. 29, *Repert.*, p. 134).—Carefully pressed and stored chips treated with so-called “Lactopulpe” (A. Moser’s Vindobonapulpe), were found to keep well until the following summer, and with a loss of only 20 per cent of dry substance. The material is considered a good feed for dairy cattle.

The fermentation of cacao, G. LAMBERT (*Bul. Sci. Pharmacol.*, 18 (1911), No. 10, pp. 574–587; *abs. in Chem. Zentbl.*, 1912, I, No. 20, p. 1632; *Jour. Chem. Soc. [London]*, 102 (1912), No. 600, II, p. 972).—The fermentation of cacao is ascribed to *Saccharomyces theobromæ*, which results in a production of alcohol. An oxidation of the coloring matter by theobromase, which is always found in the seed, takes place simultaneously.

Observations on the preparation of cacao, E. PERROT (*Compt. Rend. Acad. Sci. [Paris]*, 156 (1913), No. 18, pp. 1394–1396).—Cacao beans when subjected to fermentation in order to remove the hulls undergo several changes which result in a variable product and some losses. During the process heat is developed and certain enzymes act upon the tannin compounds, resulting in the production of a brown color. To prevent this lack of uniformity the author recommends sterilizing the cacao beans and suggests removing the hulls by subjecting the beans to the action of a dilute solution of alkali.

Soap from soy beans, A. W. PONTIUS (*Daily Cons. and Trade Rpts. [U. S.]*, 15 (1912), No. 107, p. 494; *abs. in Chem. Ztg.*, 37 (1913), No. 62, *Repert.*, p. 285).—The author states that soy-bean oil can to a certain extent be substituted for coconut oil and cacao butter, but that it must undergo a process of refining before it can be employed for this purpose.

Apocynum or Indian hemp; rubber, C. P. FOX (*Jour. Indus. and Engin. Chem.*, 4 (1912), No. 5, pp. 387, 388).—The possibilities of obtaining rubber from the Indian hemp plant are considered. Analytical data are included.

Determination of nitrogenous constituents in raw rubber, A. TSCHIRCH and W. SCHMITZ (*Gummi Ztg.*, 26 (1912), No. 52, pp. 2079–2081; *abs. in Jour. Soc. Chem. Indus.*, 31 (1912), No. 21, p. 1042).—As a solvent for rubber pentachloroethan (boiling point 159° C.), tetrachloroethan, and perchloroethylen are recommended.

“Two and five-tenth gm. of raw Para (not washed or deresinified) was dried for eight days in vacuo and placed in a 500 cc. Erlenmeyer flask with 40 to 60 cc. of pentachloroethan; cotton wool was placed in the neck. The flask was heated for 4 to 6 hours at 80° C. till all the rubber had dissolved. After cooling, the liquid was highly diluted with chloroform (about 400 cc.) and allowed to settle in a separating funnel. The precipitate was collected on an ordinary paper filter. Warning is given as to the use of a centrifuge. The residue on the filter was extracted with chloroform in a Soxhlet apparatus, dried in vacuo and weighed. The nitrogen was then determined by the Kjeldahl method. The protein contained 12 to 14 per cent of nitrogen. Ray Para contained 2.9 to 3.1 per cent of residue (11 to 12.6 per cent of nitrogen). Nearly all this nitrogen was found in the insoluble residue, in which, allowing for ash, the nitrogen was from 14 to 15.6 per cent. Preliminary experiments on the nature of the protein are described; it does not appear to be a true protein.”

Industrial hygiene of leather manufacture, with especial reference to the industry in Baden, F. HOLTZMANN (*Gewerbehygiene der Lederfabrikation mit besonderer Berücksichtigung der badischen Industrie. Inaug. Diss., Tech. Hochsch. Karlsruhe*, 1912, pp. 28).—This discusses the various stages of leather manufacture, their significance from a hygienic standpoint, anthrax in tanneries, and the healthfulness of leather workers in general. A bibliography comprising 34 titles is appended.

Preparation of tanning and coloring extracts, G. GRASSER (*Chem. Ztg.*, 37 (1913), No. 37, pp. 373–375).—This gives a short description of the technical processes used for preparing tanbark extracts and commercial vegetable coloring matters.

The hydrolysis of cellulose, I. R. WILLSTÄTTER and L. ZECHMEISTER (*Ber. Deut. Chem. Gesell.*, 46 (1913), No. 11, pp. 2401–2412, fig. 1; *abs. in Nature [London]*, 92 (1913), No. 2291, pp. 107, 108).—This is carried out by treating the cellulose with cold, fuming hydrochloric acid of a specific gravity of 1.204 to 1.212 and which contains from 40 to 41.4 per cent of hydrogen chlorid. The cellulose (cotton or filter paper), after being treated, will show within 24 to 48 hours a conversion of about 95 to 96 per cent of the theoretical quantity of dextrose. Ordinary hydrochloric acid, which contains only 37.6 per cent of hydrogen chlorid, does not decompose cellulose to this extent but merely disintegrates the fiber and causes gelatinization.

“One of the most striking observations recorded in the paper is the very high specific rotation shown by dextrose when dissolved in concentrated hydrochloric acid. In 41.4 per cent hydrochloric acid $[\alpha]_D$ at 16° C. was found to be 106° , which approximates to that of the so-called α form of dextrose (110°), the ordinary value observed in aqueous solution for the equilibrium mixture of α and β forms being 52.5° . In 44.5 per cent hydrochloric acid, however, the extraordinarily high value of 164.6° was observed for $[\alpha]_D$ at 5° C.”

Some experiments on the conversion of long-leaf pine to paper pulp by the soda and sulphate processes, S. D. WELLS (*Jour. Indus. and Engin. Chem.*, 5 (1913), No. 11, pp. 906, 907; *abs. in Science, n. ser.*, 38 (1913), No. 985, p. 710).—One hundred and fifty small batches were made in autoclaves for the purpose of studying various factors relative to the cooking process in the sulphate method. “It was found that the more caustic soda or sodium sulphid in use, the greater the concentration, the higher the temperature and the longer

the time of cooking, the lower the yields of pulp, and the lighter and easier to bleach. Caustic soda had twice the reducing power possessed by sodium sulphid."

The 19 semicommercial cooks made gave a yield of pulp corresponding to 49 per cent of the dry weight of the wood. The paper made from the pulp was stronger and tougher than the kind usually imported known as "kraft paper." The paper made from the soda pulps of the same wood were not so strong and the yield was less.

[Report of the] division of oils and varnishes, R. W. DARNER (*North Dakota Sta. Rpt. 1912, pt. 3, pp. 484-490*).—This report presents analyses of linseed oils and turpentines and data as to Chinese wood oil and lumbang oil.

Some of the linseed oils were found adulterated with mineral oil. The turpentine oils examined all seemed uniformly adulterated with from 15 to 20 per cent of a light mineral oil. Analyses of two pure samples of Chinese wood oil are reported and the chemical and physical data compared with commercial samples. They agreed well so far as specific gravity, refractive index, saponification number, and unsaponifiable matter were concerned but disagreed in the iodine number which ran higher in the commercial samples.

"The Bacon heat test was applied [to the pure samples] and a good solid 'go back' was obtained in each case. Where the test was applied to the commercial samples only one was found that responded to the test, and that gave a rather pasty solid. On inquiring into the history of these oils as to their usefulness in varnish and paint making, it was found that each sample filled the requirements. This would tend to show that while Bacon's test will indicate purity of some samples, yet it does not indicate the usefulness of the sample in paint and varnish manufacturing."

A heat test was also used, with which each of the samples responded with good "go backs." In this, 20 minutes was taken to bring 100 gm. of oil to 225° C., at which temperature it was held for 20 minutes; 10 minutes was then taken to raise the oil to between 270 and 280° where it was held for 8½ minutes.

This method has the advantage over Bacon's method in that the oil is held for 20 minutes at the same temperature used in varnish making. It also determines whether the oil darkens or changes in viscosity, which is of the utmost importance to the varnish maker.

The data with reference to lumbang oil has been previously reported (E. S. R., 29, p. 811) with the exception of an additional sample of oil obtained from other sources. This differed from those previously reported in the high saponification number and specific gravity.

Oxygen absorption of linseed oil, R. W. DARNER (*North Dakota Sta. Spec. Bul., 3 (1914), No. 1, pp. 8-11, fig. 1*).—It is pointed out that in only one of the experiments cited in the literature quoted was the light factor considered, and in none was the effect of moisture, which has been proved to have a great effect upon the drying of oil and paint films, noted. "This work was undertaken to see if under conditions that would be easily controlled all pure linseed oils would dry in about the same time. The drying tests were made in a glass case 12 in. high, 12 in. wide, and 24 in. long. This case sat on a base containing a mercury seal, so that the case was air-tight and at the same time could easily be lifted and the drying plates taken out and weighed.

"The air was first dried before being drawn through the case by a train of sulphuric acid and calcium chlorid tubes and then warmed to 25° C. by being drawn through a glass spiral tube surrounded with warm water. The humidity within the box was kept constant by exposing a No. 2 beaker containing water. The temperature within the box never varied more than 0.5° from 25°. Light was supplied by two 240 watt tungsten lamps provided with reflectors. The

oil was dried on both glass and aluminum plates 4 by 7 in. in size, with a surface ruled off for drying 3 by 6 in., giving an area of 18 sq. in. for spreading oil for drying; 0.187 gm. of oil was spread out on this surface, giving a uniform thickness of film of approximately $\frac{1}{1300}$ of an inch. Air was drawn into the box at an average rate of one-half liter per minute." The apparatus used is illustrated.

"From the results it may be seen that with the conditions named in these experiments raw linseed oils reach their maximum gain in drying very close around 80 hours and boiled oils around 24 hours. Also 10 per cent adulteration of raw linseed oil by rosin, soy-bean, and other semidrying oils may be detected, as their presence retards the time of drying of linseed oil by a good margin."

The detection of adulteration in linseed oil, G. D. ELSDON and H. HAWLEY (*Analyst*, 38 (1913), No. 442, pp. 3-7, fig. 1).—It was found that a close relation existed between the iodine number and the quantity of ether extract obtained from a partially dried linseed oil. This is especially noticeable when the iodine number and the extract are plotted against one another. The amount of ether extract from linseed oils dried for 2 hours (10 samples) varied from 14 to 19 per cent and the iodine value from 176 to 192.

Linseed oils containing 20 per cent of either colza, whale, cotton-seed, or seal oil gave iodine values which varied from 176 to 185 and ether extracts from 10.4 to 31.6.

"The following equation has been calculated from the curve for the maximum extract of a linseed oil. If I is the iodine value, then the maximum permissible extract for that oil is— $\text{Extract} = 81.9 - 0.35 I$.

"It is suggested that the routine examination of linseed oils be restricted to the determination of the iodine value and the extract as described above, by which means decisive information as to the purity or otherwise of any sample may be obtained."

Detection of the adulteration of linseed oil, R. W. DARNER (*North Dakota Sta. Spec. Bul.*, 2 (1913), No. 21, pp. 369, 370, fig. 1).—This is an application of the method described in the abstract above to the detection of soy-bean oil and other semidrying oils in linseed oil. Five samples of linseed oil examined by the method showed extreme values for the ether extracts from 14.34 to 18 per cent.

Soy-bean oil with an iodine value of 132 and sunflower-seed oil with an iodine value of 129 were used in the tests. When the results were plotted, the adulterated oils were found to lie to the left of the line within the sphere of pure oil. This result seemed to indicate that the method could not be used with certainty for the detection of the adulteration of linseed oil by semidrying oils of high iodine value.

Grape seed oil, R. W. DARNER (*North Dakota Sta. Spec. Bul.*, 2 (1913), No. 21, pp. 370-372).—After reviewing the literature in this regard (E. S. R., 29, p. 13), the results of an analysis of an oil obtained from the seeds of grapes grown in California are given. The golden yellow oil, when subjected to prolonged heating at 180° C. changes first to green and then to brown. The specific gravity at 15.5° was 0.9224, the refractive index at 20° was 1.475, iodine number 131.9, saponification number 192.6, unsaponifiable matter 0.88 per cent, acid number 1.11, acetyl value 81.09, Reichert-Meissl number 0.81, heat of bromination 22°, and Maumené test 82.5°. According to this the acetyl value of 144.5 reported by Horn needs confirmation.

Very small amounts of volatile acids, i. e., caproic, butyric, valeric, and caprylic, as evidenced by the Reichert-Meissl number, are present in grape seed oil. The Hehner number or insoluble acids was 93.9 per cent and the soluble

acids 0.35 per cent. The constants of the fatty acids were solidifying point 19.5, melting point 25°, iodine number 136.4, and saponification number 204.3.

"Summarizing the results obtained, the following is the approximate composition of the oil: Linolein 59.8, olein 29, palmitin 8.6, stearin 1, and unsaponifiable and undetermined matter 1.24 per cent."

From the drying tests it would seem that this oil with a dryer added will produce a very good paint.

Tomato-seed oil in Italy, L. J. KEENA (*Daily Cons. and Trade Rpts. [U. S.], 16 (1913), No. 273, p. 954*).—In 1912 about 5,000 metric tons (2,204 lbs. each) of wet tomato residue was worked up and yielded 1,500 metric tons of dried residue. From this material 150 tons of tomato-seed oil, 800 tons of oil cake, and 500 tons of tomato peel were obtained. The oil is used extensively for the manufacture of soap, and experiments are under way for the manufacture of an edible oil from the crude oil. The cake is used as a stock feed and the peel as a fertilizer. At Parma the seeds from the tomato-preserving factories have been selling for 1.6 lira per quintal (14 cts. per 100 lbs.).

"In the vicinity of Naples, tomato residue in the wet state, just as it comes from the preserving factory, has been sold during the past year at 4.5 to 7.9 cts. per 100 lbs. The wet residue must be collected and dried daily as it ferments within 48 hours if allowed to stand. When dried it sells at Naples, f. o. b. cars, sack packing included, at \$1.75 to \$2.20 per 100 lbs. The industry is still considered to be in its infancy, but promises to become more important."

The effect of "lime-sulphur" spray manufacture on the eyesight, A. J. WEITH (*Jour. Indus. and Engin. Chem., 4 (1912), No. 12, p. 917*).—"In making small batches of lime-sulphur spray in an uncovered kettle in the open air, symptoms very similar to the ones [previously noted (*E. S. R., 30, p. 16*)] were experienced, although no permanent blurring of the vision resulted. The eyelids, however, became very red and were badly swollen. Since the trouble with the eyesight came only near the end of the 'cook,' and was very similar to the smarting sensation produced by getting the diluted spray in the eye, it was supposed that the disagreeable effects were caused by particles of solid material carried out with the escaping steam. No experiments were undertaken to prove this point."

Report of the activities of the Swiss Agricultural-Chemical Institute at Bern (Liebefeld) during the year 1912 (*Landw. Jahrb. Schweiz, 27 (1913), No. 7, pp. 389-407*).—During the year 9,164 samples were examined, which consisted of 4,073 fertilizers, 2,078 feeds, 2,969 samples of material obtained in vegetation experiments, 18 soils, and 26 miscellaneous materials. Some results of vegetation tests are also included.

METEOROLOGY—WATER.

The present condition of agricultural meteorology in Brazil, H. MOREZ (*Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 4 (1913), No. 9, pp. 1313-1316*).—The status, object, and proposed work of the meteorological service organized under the ministry of agriculture in 1910 in cooperation with the various States of Brazil are briefly discussed.

[Meteorological observations], D. A. SEELEY (*Ann. Rpt. Sec. Bd. Agr. Mich., 52 (1913), pp. 111-126*).—Tabulated daily and monthly summaries are given of observations during the year ended June 30, 1912, at East Lansing, Mich., on temperature, pressure, precipitation, cloudiness, wind movement, etc.

Meteorology (*Rpt. Lincoln Co. [Nev.] Expt. Farm, 1911-12, pp. 31-36*).—Tables are given which show the maximum and minimum temperatures and

the precipitation at the experiment farm from September 1, 1910, to December 31, 1912.

Meteorological summary for the year 1912, J. F. WILSON (*Wyoming Sta. Rpt. 1913, pp. 125-135, figs. 6*).—Monthly summaries are given of observations at Laramie, Wyo., during 1912 on temperature, pressure, precipitation, humidity, sunshine, cloudiness, and wind movement. A record of soil temperature at depths of 3, 6, 12, 24, 36, and 72 in. during 1912 is also given.

The highest temperature was 87° F., August 26; the lowest, -20°, February 4. The total precipitation was 14.79 in. The lowest relative humidity was 11 per cent, August 26. The greatest velocity of wind was 72 miles per hour, February 17.

On the amount of radioactive products in the atmosphere, S. SATÔ (*Sci. Rpts. Tôhoku Imp. Univ., ser. 1, 2 (1913), No. 4, pp. 171-174*).—In observations at Tôhoku University, Japan, by means of a negatively charged wire stretched horizontally above the ground, the numbers of atoms of radium and thorium emanations per cubic centimeter of air calculated from the results were, respectively, $N_E=1.5$, $N'_E=1 \times 10^{-4}$.

The soot-and-dust-fall of English towns and cities, J. B. C. KERSHAW (*Sci. Amer., 110 (1914), No. 3, pp. 63, 64, figs. 3*).—This is a brief account of the plan proposed by the International Conference on Smoke Abatement for the systematic study of the amount and character of the solid impurities in the atmosphere of large towns and manufacturing centers, and which has been put into effect in England and to a less extent in Germany. Reference is made to methods and apparatus used and to some of the results already obtained in such studies. These indicated that the soot and dust fall varies in certain English centers from 200 to 2,000 tons per square mile per annum.

The correlation of rainfall, J. PECK and E. C. SNOW (*Quart. Jour. Roy. Met. Soc. [London], 39 (1913), No. 168, pp. 307-316; abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 4 (1913), No. 12, p. 1844*).—From a study of the rainfall at 30 stations in southern and southeastern England during 1908 to 1911, inclusive, the authors conclude "that while the relative rainfall in December can be predicted from a knowledge of the rainfall in two or three of the previous months with a small degree of probability, that of June and July can not be foretold with the slightest degree of probability."

Rainfall as a determinant of soil moisture, F. SHREEVE (*Plant World, 17 (1914), No. 1, pp. 9-26, figs. 3*).—This paper presents "a digest of a short record of desert rainfall, interpreted in terms of its possible effect upon soil moisture; gives data showing the annual march of water content at three depths in a retentive clay soil; indicates the relative potency which different falls of rain were found to have in renewing the store of soil water; and estimates the relative efficiencies of various percentages of soil water for the maintenance of plant activity by correlating them with the concurrent rates of aerial evaporation." The observations were made at the Desert Laboratory near Tucson, Ariz.

Summarizing the results, it is stated that "the average annual rainfall at the Desert Laboratory is 14.60 in. There are two rainy seasons, that of the summer averages 63 days in length, but yields 54 per cent of the annual rainfall. The average number of rainy days is 61.5 per annum, on 46.2 of which the rainfall is less than 0.25 in. In six years there were 32 days with more than 0.75 in. of rain, and they yielded 46 per cent of the total rainfall of the six years. There have been periods of 140 days without rainfall of sufficient amount (0.15 in.) to affect the soil moisture.

"The march of soil moisture during the year is closely related to the amounts of the significant falls of rain, and the changes of moisture content are con-

servative at the lower depths (15 cm. and 30 cm.) in the heavy clay soil investigated. The moisture at 3 cm. falls as low as 1 per cent and that at 30 cm. rises to as much as 32 per cent. The average moisture of the soil from the surface to 30 cm. in the driest weeks of the year is 6.5 per cent, in the wettest is 29 per cent. At its minimum water content the clay soil contains about one-fourteenth of the annual supply of water furnished it by the normal rainfall.

"The weekly rate of atmospheric evaporation ranges from a minimum of 173 cc. to a maximum of 1,084 cc.—the annual total being 31,447 cc., in terms of loss from a porous cup atmometer. This is equivalent to a loss of 345 cc. per square centimeter from a free water surface. The ratio of evaporation to rainfall is as 9.3 is to 1.

"The ratio of evaporation to soil moisture fluctuates from a minimum amount to a maximum which are in the proportion of 1 to 10. The ratio of evaporation to soil moisture at the foot of the Santa Catalina Mountains is 9.7 times the same ratio for their summit. The annual amplitude of moisture conditions at the Desert Laboratory is as great, therefore, as that which exists in the most arid portion of the year between localities which are 5,000 vertical feet apart."

Effect of forests on run-off, J. C. STEVENS (*Jour. Electricity*, 32 (1914), Nos. 3, pp. 49-51, figs. 2; 4, pp. 73-75; 5, pp. 93-95; 6, pp. 116, 117, fig. 1; 7, pp. 135-137, figs. 3; 8, pp. 166, 167, fig. 1; 9, pp. 190, 191, figs. 4).—In a somewhat detailed discussion of the effects of forests on run-off, in which he deals with several watersheds as examples, the author reaches the conclusion "that uniformity of stream flow is influenced, practically in total, by factors entirely independent of forests, and if forests have any influence at all on this feature, it is very insignificant. The tendency they do possess, though almost infinitesimal, would be in a helpful direction in some cases, in others in a harmful direction."

Note on the chlorin content of rain water at Tortugas, Fla., R. B. DOLE (*Jour. Wash. Acad. Sci.*, 4 (1914), No. 1, pp. 3, 4; *abs. in Chem. Abs.*, 8 (1914), No. 4, p. 767).—A chlorin content of 2.9 parts per million of water was found.

Water, E. P. WIGHTMAN (*Pop. Sci. Mo.*, 84 (1914), No. 3, pp. 218-226).—The more important facts regarding the composition, properties, and importance in the economy of life of water in gaseous, liquid, and solid forms are summarized in this article.

Ground water and wells, H. HÖFER VON HEIMHALT (*Grundwasser und Quellen. Brunswick*, 1912, pp. XI+135, figs. 51).—The author has attempted in this work to present a hydrogeological text-book to serve as a guide in dealing with both the theoretical and practical sides of problems relating to ground water and wells. The principal topics discussed are the physics, chemistry, and biology of water supplies relative to quality and judgment; soil water from the infiltration of atmospheric precipitation; ground water, its origin, movement, and relation to streams and lakes; shape, grade, and variations of ground water level; ground water strata; influence of pumping on ground water; rock water; wells and their yield; dependence of quality of water on geological conditions; pollution of ground water and wells and means of protection; and water supplies for villages.

North Dakota waters, E. F. LADD (*North Dakota Sta. Rpt. 1912, pt. 3, pp. 449-483*).—This article notes the dangers from contamination of water supplies, discusses such subjects as solids and organic matter in water, boiler and antifoaming compounds, and purification of water, warns against the use of so-called household and faucet filters, and gives analyses of a large number of waters from wells and other sources in North Dakota.

The fertilizing value of sewage and sewage sludge, H. W. CLARK (*Mo. Bul. Bd. Health Mass., n. ser., 8 (1913), No. 12, pp. 473-490*).—Reviewing experience abroad as well as in this country, the author concludes that only under the most favorable conditions can the returns from sewage farms be made to pay operating expenses, and he maintains that an instance is yet to be cited where these returns pay both the cost of operation and interest on the capital invested. "The exceptions, perhaps, to this are certain tracts or farms in regions of low rainfall and where the sewage is valuable as a liquid, that is, for real irrigating purposes."

It is stated that the fairly strong domestic sewage of the city of Lawrence contains about 4.28 parts of nitrogen, 1 part of phosphoric acid, and 1.5 parts of potash per 100,000 parts of sewage, making the sewage worth as a fertilizer about 6 cts. per 1,000 gal.

It is stated that average American sewage contains about 2,400 lbs. of sedimentable matter in a million gallons, and this sludge contains fertilizing and fatty materials worth approximately \$15 to \$18. The recovery of the fatty matters and the preparation of the sludge for use as a fertilizer has been attempted in a few places, but the profitability of the practice is still in doubt.

"It has also been well proved that the nitrogen, phosphoric acid, etc., present are generally in a less assimilable form than the same bodies in ordinary commercial fertilizers. The sludge has value, however, and as the processes of drying, pressing, and fat separation are improved, and also as nitrogen advances in price, as seems inevitable, sewage sludge will become of greater agricultural value than it is at present, especially as the basis of a fertilizer enriched by the addition of potash, phosphates, etc."

SOILS—FERTILIZERS.

Field experiments and the interpretation of their results, A. GRÉGOIRE (*X. Cong. Internat. Agr. Gand, 1913, Sect. 2, Question 1, pp. 13*).—The probable error in field experiments and methods of determining and reducing it are discussed. Reference is made to similar studies by Mercer and Hall, Wood and Stratton, Holtsmark, and Mitscherlich (*E. S. R., 27, p. 519*), and the results of experiments by Wagner are analyzed with reference to the probable error in them. As a result of such an analysis of 250 tests made at least in triplicate it was found that the probable error in each individual test exceeded 4.7 per cent in 50 cases out of 100, 6.6 per cent in 25 cases, 8.5 per cent in 9, and 10.5 per cent in 2.

The author's general conclusion is that out of 100 field experiments, as a whole, the probable error may exceed 5 per cent in 73 cases, 6 per cent in 64, 7 per cent in 52, 8 per cent in 39, 9 per cent in 30, 10 per cent in 18, 11 per cent in 9, and 12 per cent in 4. He shows that results from a single plat are almost always worthless. The probable error is decreased by increasing the number of plats, which should not be less than three.

With larger field experiments it is very difficult to keep the probable error below 10 per cent, and generally impossible to keep it below 5 per cent. This indicates that the larger majority of the results of field experiments, as ordinarily conducted, are not only not worthy of serious consideration but may be a veritable detriment to practical agriculture and discreditable to agronomic science.

Proposal for an international uniform classification of soils, D. A. LOUIS (*X. Cong. Internat. Agr. Gand, 1913, Sect. 2, Question 8, Commun. D, pp. 5*).—

A simple scheme of classification and nomenclature proposed for international use in reporting results of field experiments is described and advocated.

The mechanical and chemical composition of the soils of the Sussex area, New Jersey, A. W. BLAIR and H. JENNING (*Geol. Survey N. J. Bul. 10 (1913), pp. 110, pls. 2*).—This bulletin, one of a series reporting work which has been conducted cooperatively by the Bureau of Soils of this Department, the Geological Survey, and the New Jersey State Station, briefly describes the geography and geology of the Sussex area in northern New Jersey, and discusses the mechanical and chemical composition of samples of 10 soil series and types encountered. Methods of analysis are described by R. B. Gage.

It is shown that the soils of the area are often deficient in lime, and magnesia is almost invariably present in excess of the lime. They are well supplied with potash and phosphoric acid, but frequently respond to applications of commercial fertilizers containing the latter in available form. There is more potash in the subsoil than in the soil, while the phosphoric acid is slightly less in the subsoil.

"Many of the soils are fairly well supplied with nitrogen, though some . . . are quite deficient in this material. Generally there is about three to four times as much nitrogen in the soil as in the subsoil. Applications of lime, together with more thorough cultivation and a more extended use of green manure crops, will do much toward making these soils more productive than they are at present."

Soil analyses, J. W. INCE (*North Dakota Sta. Rpt. 1912, pt. 3, pp. 439-445*).—Analyses of samples of alkali soils producing a poor crop showed "enough soluble salts . . . to prevent the growth of almost anything except possibly saltgrass." Treatments suggested for such soils are cultivation, application of manure and gypsum, and washing by irrigation and drainage. In pot experiments with oats, timothy, and alfalfa in these soils, gypsum, at the rate of 1,000 lbs. per acre, gave slightly better results than the untreated soil in the case of timothy and oats, and blood at the same rate acted very favorably.

Analyses of other soils for alkali and fertility constituents are reported.

Stations for soil investigations with reference to the soils of tropical South America, G. MEDINA (*X. Cong. Internat. Agr. Gand, 1913, Sect. 2, Question 1, pp. 10*).—This article is based upon observations and experiments on the red soils of Brazil, which have undergone marked deterioration under culture in many cases. Comparative analyses of virgin forest soil and of similar soil after exhaustion by culture show a decline of nitrogen under culture from 0.76 to 0.07 per cent, of phosphoric acid from 0.53 to 0.09 per cent, of potash from 0.26 to 0.01 per cent, and of lime from 0.03 per cent to a trace, but an increase of iron oxid from 18.3 to 20.09 per cent and of silicates from 20.22 to 25.07 per cent. The soils are acid and poor in lime. The phosphoric acid is to a large extent, if not exclusively, combined with iron, and the potash is in the form of silicates. The soil conditions generally are unfavorable for active nitrification although there is rapid decomposition of the organic matter of the soil.

Fertilizer experiments on the red soils with coffee, sugar cane, rice, and rubber are briefly reported. These show, in general, that the soils respond generously to applications of fertilizers.

A classification of soils in general, with reference to altitude, latitude being a secondary consideration, is proposed and a plan of cooperative study of the red soils of Brazil and their relation to the fixation of potash, phosphates, and other fertilizing constituents is suggested.

The marsh formations on the German North Sea coast, H. GRUNER (*Die Marschbildungen an den Deutschen Nordseeküsten. Berlin, 1913, pp. 155, figs. 7*).—In this publication the kind and origin of the marsh lands of the region

are discussed in connection with the characteristics of the different soil formations and their mechanical, physical, and chemical structure. These marsh lands are said to have originated, principally, through glacial action, and gradual rising and sinking of the seacoast. Fourteen different soil formations are described, several of which apparently represent different stages of formation of the same soil caused by alternate rising and sinking of the coast. The majority of these formations are of high or average fertility, being for the most part characterized by a considerable content of lime and humus and an appreciable content of potash and phosphoric acid. The most important types appear to be the muck-sand and muck-clay soils, which contain much humus, lime carbonate, fine sand, and fine clay, and are said to be the deposits of receding floods. The more recent muck formations are saline. The less productive types are tough clays intermixed with coarse gravel and iron compounds.

The coast marsh districts and the so-called river and lake marshes of the region are described with reference to the distribution of the soil types, and discussed from the standpoint of improvement and profitable utilization.

The soils of Uruguay, J. PUIG Y NATTINO (*Min. Indus. [Uruguay], Insp. Nac. Ganaderia y Agr. Bol.* 6 (1913), pp. 30+4, pl. 1).—This bulletin gives results of physical and chemical analyses of 138 soil samples from different States in Uruguay, a chart showing the location of the soils by States, and a classification of the soils as regards their physical and chemical properties and plant food content.

The parent rocks and consequently the soil formations are very varied, the soils usually being formed by weathered materials transported from more or less distant points. The predominating soil types show in general sufficiently firm and resistant qualities due to the relatively high content of fine sand and clay. The soils are generally relatively deficient in lime, although some show a high lime content, and are on the whole rich in humus and nitrogen. The phosphoric acid content appears to be usually a little low, the potash content on the whole relatively high.

The determination of the reaction and the basicity of soils and their importance in soil examination, H. R. CHRISTENSEN (*X. Cong. Internat. Agr. Gand, 1913, Sect. 2, Question 3, pp. 10*).—This article discusses the importance and methods of determining the reaction and basicity of soils. It points out their relation not only to the growth of higher plants but also to the activity of the microflora of the soil. These determinations furnish a valuable indication of the lime and other fertilizer needs of the soil, the crops best adapted to it, the weeds and other injurious plants, and plant diseases most likely to thrive in it.

Experiments with water solutions of the soil, G. LEONCINI and G. MASONI (*Staz. Sper. Agr. Ital., 46* (1913), No. 7-8, pp. 525-539).—Studies of soil solutions showed their power of flocculation to be inversely proportional to the quantity of kaolin remaining in suspension in a solution after a fixed time, comparison being made with the amount held in suspension in distilled water under the same conditions. The powers of flocculation of soil solutions varied with the soil and with the method of preparing the solutions.

It is concluded that the power of flocculation of a soil solution is not only an index of the individual properties of a soil, but also indicates accurate methods of analysis.

Circulation of nitrates in the soil, L. MALPEAUX and G. LEFORT (*Ann. Sci. Agron., 4, ser., 2* (1913), II, No. 6, pp. 705-726, figs. 2; *abs. in Chem. Abs., 8* (1914), No. 7, p. 1320).—In a continuation of previous experiments (E. S. R., 28, p. 720), the authors observed the influence of sodium nitrate fertilization at the surface and at depths of 5, 10, 17, and 30 cm. and of rainfall and capillarity

on the diffusion of the nitrate in fallowed and cropped soils, and also the effect of depth of fertilization on the growth and yield of sugar beets.

The best average results were observed with the deeper fertilization, the nitrate diffusion in both fallowed and cropped soils being more prompt and uniform, and the nitrate absorption by sugar beets in the cropped soil and the growth and yield of sugar beets being greater. Although the total yield of sugar per acre was greater with deeper fertilization, the percentage of sugar in the beets was slightly greater with shallow fertilization. It is concluded that for prompt and uniform diffusion of nitrates in cultivated soil, fertilization should take place with the cultivation preceding the seeding. The accumulation and consequent utilization of nitrates near the surface by plants is attributed to capillarity. The general conclusion is that nitrates are not carried out of reach of plant roots by summer rains and that it is therefore useless to add the fertilizer at intervals in fractional amounts.

Nitrate formation in forest soil, K. VOGEL VON FALCKENSTEIN (*Internat. Mitt. Bodenk.*, 3 (1913), No. 6, pp. 494-528).—Investigations with various kinds of soils showed that light forest soils poor in lime, usually with a matted litter covering overlying humus mineral soils, produced under favorable moisture conditions sufficient quantities of nitrate to satisfy the demands of the forest growth. In such soils, when dry, a new well-decomposed litter covering of pine needles and beech leaves strongly promoted nitrate formation. Black humus apparently had only an indirect effect and did not promote nitrification, and a dry peat covering was found to aid but little in nitrate formation. Mixing the litter covering with the sand soils increased nitrate formation. It is stated that dry peat layers when treated in this way should be limed to hasten decomposition.

In wet sandstone soils deficient in lime imperfect decomposition of the usually large accumulation of humus caused a poor utilization of the total nitrogen, which was most marked with peat litter coverings.

Heavy forest soils rich in lime were always found to be richer in nitrates than light soils poor in lime. The matted litter covering is said to be usually absent in such soils on account of rapid decomposition, but the humus-rich mineral layers produce considerable quantities of nitrate. The humus in these layers is protected from too rapid decomposition but becomes very active when air is admitted, and leaching away of nitrates is in large measure prevented by the physical condition of the soil. The author concludes that the condition of a soil as to nitrate formation serves as an indication of its forest-producing powers.

Rothamsted investigations on the production of plant food in the soil, E. J. RUSSELL (*X. Cong. Internat. Agr. Gand, 1913, Sect. 2, Question 3, pp. 6*).—A brief account is given of investigations at Rothamsted, more particularly on the nitrogen supply of soils.

A list is given of publications on the subject by the author and his associates. Methods for the biochemical study of soil, J. STOKLASA (*X. Cong. Internat. Agr. Gand, 1913, Sect. 2, Question 3, pp. 14*).—A scheme for the complete biochemical examination of soils is outlined.

[Soil bacteriological investigations], F. H. H. VAN SUCHTELEN (*Michigan Sta. Rpt. 1913, pp. 149-155*).—The opinion is expressed that soil bacteriology can be successfully developed only by a thorough study of the soil solution in relation to the growth of bacteria. A method of obtaining unaltered soil solution by means of displacement with paraffin oil is briefly referred to, and results of chemical and physiological studies with solutions so obtained are noted.

Investigations on soil fatigue, H. KASERER (*Mitt. Landw. Lehrkanz. K. K. Hochsch. Bodenkul. Wien, 2 (1913), No. 2, pp. 375-410, figs. 6; abs. in Chem.*

Ztg., 37 (1913), No. 116, p. 1175).—Numerous investigations of flax and pea sickness of soil showed that the repeated growing of flax or peas caused the so-called germination fatigue, by which the seeds rotted before or during germination. The ability of the seeds to resist this action was found to depend more or less on the conditions of seed bed and soil, and on moisture and temperature conditions, etc. Soils which were germination-tired for peas had more or less the same effect on flax and vice versa. According to the author, germination fatigue is different from growth fatigue, which was particularly observed with flax. Well-cultivated plants grew poorly in healthy soil to which about 15 per cent of flax-sick soil had been added. Similarly, a small addition of good flax straw to the soil had a bad effect on the growth of flax.

While the germination fatigue disappears over winter, growth fatigue is said to exist a longer time. It is stated that only by further investigation can it be determined whether the germination and growth fatigue are due to the activity of micro-organisms or to poisonous substances excreted by plants and which may also be contained in straw.

Essentials in the management of California soils, C. B. LIPMAN (*Mo. Bul. Com. Hort. Cal.*, 3 (1914), No. 1, pp. 19–26).—The author points out that the deep soils of the arid region are due to the slow formation of clay resulting from the relatively infrequent action of the leaching and weathering agencies. He advocates as the six most important measures in maintaining the fertility of California soils (1) deep plowing, (2) prevention of formation or breaking up of plowsole, (3) irrigation in deep furrows, (4) deep incorporation of manure and fertilizers, (5) frequent summer cultivation, and (6) green manuring and the maintenance of the humus and nitrogen supply.

The effect of treating sand soil with moor soil, C. KRÜGER (*Mitt. Ver. Förd. Moorkultur Deut. Reiche*, 30 (1912), p. 402; *abs. in Zentbl. Agr. Chem.*, 42 (1913), No. 10, pp. 651, 652).—Treatment of sand soil with different amounts of moor soils and treatment of quartz sand subsoil with different amounts of moor humus slightly increased the total yield of oats but decreased the percentage of grain in the total yield, and also the single grain weight. The treated soils had always a higher water content than the untreated soils, but relatively little of it was available to plants. It is thought that such treatment in dry seasons without irrigation would result in a considerably decreased yield.

Gullying and its prevention, F. H. H. CALHOUN (*South Carolina Sta. Circ.* 20 (1913), pp. 36, pl. 1, figs. 13).—This circular contains a popular discussion of the cause of erosion of farm lands, particularly through the agency of water, the necessity for its prevention, the means of checking the erosion, and the methods of restoring eroded land to its original fertility.

The disadvantageous results of unchecked washing of fields are pointed out as (1) sheet erosion, which tends to strip the tops of the hills of fertile soil and in time covers the lower slopes with less productive debris; (2) the formation of gullies, which render cultivation difficult, allow the escape of soil moisture, humus, natural plant food, and commercial fertilizers; (3) the change of soil texture from desirable loams to clays and sands; (4) the covering of fertile bottom lands with material from gullies; (5) the filling of rivers, harbors, and reservoirs with sediment; and (6) the depreciation of farm-land values.

Means suggested and described for checking and remedying these harmful results are (1) proper cultivation, (2) deep plowing, (3) preventing incipient gullying, (4) hillside ditching, (5) proper terracing, (6) filling gullies by leveling or by obstructions, and (7) reforestation.

Green manuring in California, C. B. LIPMAN (*California Sta. Circ.* 110 (1913), pp. 3).—A brief popular summary of information on this subject.

Efficiency of soluble manures in dry years, F. LÉONARDON (*Rev. Agr. et Vit. Afrique Nord*, 1913, Nos. 49, pp. 151-155; 50, pp. 180-186; *abs. in Internat. Inst. Agr. [Rome]*, Mo. Bul. Agr. Intel. and Plant Diseases, 4 (1913), No. 4, pp. 553-557; *Chem. Abs.*, 8 (1914), No. 5, p. 979).—The results of demonstration experiments with various crops in different parts of Algeria and Tunis in 1911-12 are summarized, showing in general the high efficiency of mineral fertilizers as compared with organic manures. Sodium nitrate was especially effective. The results indicated that there is a minimum of moisture below which fertilizers give little or no benefit. There was little increase from the use of fertilizers on soils containing less than 15 per cent of moisture.

Soil nitrogen.—Green manures (*Georgia Sta. Circ.* 71 (1914), pp. 2).—In this circular some practical deductions are drawn from the investigations previously noted (E. S. R., 30, p. 517), viz, that cotton-seed meal, tankage, and dried blood are nitrified in the acid soils experimented with more readily than ammonium sulphate, unless the soils are limed, but since the field experiments of the station have shown that the sulphate is a more effective fertilizer for corn and cotton than the other substances named it apparently can be readily utilized by crops whether nitrified or not.

The further inference is drawn from the results that the soil bacteria do not ferment green manures in such a way as to produce acids, "but on the other hand their action is such as to neutralize partly any acid that might be present in the soil."

Nine years' experiments with the new nitrogenous fertilizers, S. RHODIN (*Meddel. Centralanst. Försöksv. Jordbruksområdet*, No. 75 (1913), pp. 17; *K. Landtbr. Akad. Handl. och Tidskr.*, 52 (1913), No. 3, pp. 192-206).—A summary is given of experiments with sodium nitrate, ammonium sulphate, calcium nitrate, and calcium cyanamid for cereals, hay, root crops, and potatoes conducted by the Swedish experiment station during the period 1903 to 1911. Of the fertilizers mentioned the calcium nitrate produced the best results for grass, roots, and potatoes, while for cereals, especially oats, which do not require much lime, it proved inferior to sodium nitrate. Even in this case, however, the application of calcium nitrate gave profitable returns.

The after effects of the fertilizers were studied in a number of trials with sodium nitrate, ammonium sulphate, and cyanamid on a stiff clay. On the average for three crops of spring grains and two of potatoes the relative increase in yield of dry matter during the second and third years from the nitrogenous fertilizers, above that of the control plats, was as follows: Sodium nitrate 100, ammonium sulphate 115, and calcium cyanamid 108.

The nitrate position and results (*Economist*, 78 (1914), No. 3672, pp. 71, 72).—The total exports of nitrate from Chile are stated to have been slightly greater in 1913 than in 1912. Europe and Egypt took 1,816,170 tons, about 6 per cent less, and the United States 560,010 tons, about 25 per cent more. An attempt was made to restrict production but was not entirely successful. It is thought that the prospect for greatly increased use is not good unless there is still further decline in price.

Phosphate deposits in southwestern Virginia, G. W. STOSE (*U. S. Geol. Survey Buls.* 540-L (1913), pp. 16, figs. 3; 540 (1914), pp. 383-398, figs. 3; *abs. in Amer. Fert.*, 40 (1914), No. 2, pp. 54-56, 60, fig. 1).—Deposits observed at two places, one near Saltville and the other near Marion, are described. The phosphate bed is composed of grains and small pebbles of quartz, glauconite, and phosphate nodules. The richest sample of phosphate rock collected contains 27.17 per cent of phosphoric acid. The commercial importance of the deposits was not determined.

The use of lime and gypsum on California soils, C. B. LIPMAN (*California Sta. Circ.* 111 (1913), pp. 4).—A brief popular summary of information on this subject.

New fertilizers, D. ZOLLA (*Rev. Gén Sci.*, 24 (1913), No. 19, pp. 730-732).—The results of experiments by various investigators with salts of lead, uranium, and manganese, calcium nitrate, and cyanamid are briefly reviewed.

The influence of catalytic substances, G. RIVIÈRE and G. BAILHACHE (*Jour. Soc. Nat. Hort. France*, 4. ser., 14 (1913), Dec., pp. 782-788).—Series of plant experiments extending over several years to test the influence of sodium arsenate, manganese chlorid, and ammonium vanadate on winter wheat; sodium borate, fluorid, and iodid on spring wheat; zinc sulphate, sodium arsenate, manganese sulphate, and ammonium vanadate on oats; and lithium carbonate, rubidium chlorid, rubidium alum, and cesium chlorid on beets are reported.

As a rule the application of the substances named in amounts generally not exceeding in any case 89 lbs. per acre increased the yield to a marked extent. There were, however, in numerous unexplained cases, unfavorable results indicating the need for further careful study of the subject before the use of catalytic fertilizers in practice can be safely recommended.

Sulphur and iron pyrites as fertilizers, V. VERMOREL and E. DANTHONY (*Jour. Agr. Prat.*, n. ser., 26 (1913), No. 47, pp. 651-653; *Bul. Soc. Nat. Agr. France*, 73 (1913), No. 9, pp. 696-702; *Engrais*, 28 (1913), No. 47, pp. 1304-1306; *Bul. Agr. Algérie et Tunisie*, 19 (1913), No. 20, pp. 397-400; *abs. in Jour. Bd. Agr. [London]*, 20 (1914), No. 10, pp. 901, 902; *Chem. Abs.*, 8 (1914), No. 3, pp. 545, 546; *Internat. Inst. Agr. [Rome]*, *Mo. Bul. Agr. Intel. and Plant Diseases*, 5 (1914), No. 1, pp. 61-63).—In the pot experiments reported it was found that sulphur applied at rates of from 44.6 to 89.2 lbs. per acre and iron pyrites (containing 50 per cent sulphur) at rates of 89.2 to 178.5 lbs. per acre increased the yields of wheat and beans 30 to 60 per cent when used in combination with organic matter (with dried blood as the source of nitrogen). They were without effect when used on soils lacking in organic matter and receiving nitrogen in the form of sodium nitrate. Better results were obtained when the sulphur and pyrites were mixed with the soil than when applied as a top dressing. Pyrites were more effective than sulphur on wheat and less effective on beans.

The law of minimum (*Mitt. Deut. Landw. Gesell.*, 28 (1913), No. 43, pp. 595-598, figs. 4).—The first part of this article discusses the law of minimum as defined by Mitscherlich. The second part illustrates by diagram the application of the law.

The use of commercial fertilizers in Canada, L. E. EMSLIE (*Internat. Inst. Agr. [Rome]*, *Mo. Bul. Agr. Intel. and Plant Diseases*, 4 (1913), No. 4, pp. 558-560).—It is stated that "the use of commercial fertilizers in Canada has scarcely passed the initial stage, although in the Maritime Provinces, more especially in the fruit and potato-growing districts, fertilizers have been popular for years. Ontario and Quebec have, during the past five years, been giving the subject more attention and may be expected rapidly to increase their consumption from this stage. British Columbia quickly learned the value of fertilizers and takes high rank as a consumer. This year a Victoria firm shipped a carload of fertilizer to Dawson City in the Yukon. The Provinces of the middle-west will not be heavy consumers for many years to come, although the use of fertilizers there has commenced, chiefly among market gardeners and potato growers, but they are also being used to a small extent by grain growers. . . . In the younger Provinces of Alberta and Saskatchewan the interest in the fertilizer question seems greater than in Manitoba."

Fertilizers to the value of \$1,773,861 were imported into Canada during the year ended February 29, 1912.

Data regarding the relative care and use of farm manures in the different Provinces are given.

The fertilizer industry (*Thirteenth Census U. S., 10 (1910), pp. 575-585, figs. 2*).—Statistics of the fertilizer industry in the United States for 1909 are summarized and discussed, and the growth of the industry since 1859 is indicated. In 1909 there were 550 fertilizer establishments, employing 21,950 persons, representing a capital of \$121,537,451, and yielding products valued at \$103,960,213.

AGRICULTURAL BOTANY.

Indicator significance of vegetation in Tooele Valley, Utah, T. H. KEARNEY ET AL. (*U. S. Dept. Agr., Jour. Agr. Research, 1 (1914), No. 5, pp. 365-417, pls. 7, figs. 13*).—A study is reported of the vegetation of the Tooele Valley in central Utah in which an attempt was made to correlate the distribution of the vegetation with the physical and chemical properties of the soil with a view to ascertaining the agricultural value of the soil.

It was found that in this valley the different types of native vegetation indicated the conditions of soil moisture and salinity of the land on which they were found and afforded a basis for estimating its capabilities for crop production. The sagebrush (*Artemisia tridentata*) association indicates land well adapted to both dry land and irrigation farming. The Kochia (*K. vestita*) association areas are adapted to irrigation farming, although the impervious nature of the soil might hinder washing out the salts to a depth which would permit profitable crop production. The shadscale (*Atriplex confertifolia*) association occupies land in which dry farming is rather precarious, but where water is available for irrigation the salts could probably be leached to a greater depth than on Kochia land. The greasewood-shadscale (*Sarcobatus vermiculatus* and *A. confertifolia*) association occupies land that is strongly saline below the depth of the first foot and is not suitable for dry farming, but can be made to produce good crops under irrigation if drainage is provided. The presence of the grass flat vegetation indicates a soil of high moisture capacity, somewhat saline, and not suitable for crop production unless drained. The salt flats are not adapted to crop production under present conditions.

Stomatal characteristics of varieties of sugar cane, W. R. DUNLOP (*West Indian Bul., 13 (1913), No. 4, pp. 314-323, pls. 2*).—A study has been made of varieties of sugar cane to determine whether there is any relation between the stomata of the leaves and the resistance of plants to drought. A considerable number of varieties were microscopically examined, and it was found that stomatal density per unit of area is so characteristic of certain varieties that this factor may be used in their recognition. There seems to be some evidence that susceptibility to drought is affected by extremes as regards the ratio of the total stomatal area to the entire area of the foliage. The curling of the leaves is considered more important in limiting the effective action of the stomata than the stomata themselves. It is thought that the distribution of certain varieties of cane would be limited to definite regions were it not for the correlation between leaf habit and stomatal characteristics.

Stomata and drought resistance in maize, H. A. WAGER (*So. African Jour. Sci., 9 (1913), No. 8, pp. 183-185*).—The author reports on a study of the relationship between number of stomata present and power of drought resistance in leaves of Indian corn. It is stated that the stomata were larger but less

numerous on the upper side of the leaves. The author inclines to the view that the drought resisting capacity does not bear any close relation to number of stomata, but that it is related to the presence of a peculiar structure on the epidermis of the leaves in the form of small special groups of absorbing and storing cells, which are to be further investigated.

Studies in the chlorophyll group.—XIX, The inconstancy of chlorophyll quotients in leaves and their biological meaning, H. BOROWSKA and L. MARCHLEWSKI (*Biochem. Ztschr.*, 57 (1913), No. 5-6, pp. 423-429).—This is a partial review of work previously reported by Jacobson and Marchlewski (*E. S. R.*, 28, pp. 110, 608), with notes replying to some criticisms offered thereto.

The rôle of oxygen in germination, C. A. SHULL (*Bot. Gaz.*, 57 (1914), No. 1, pp. 64-69).—In a previous study (*E. S. R.*, 26, p. 531), the author found that there was either a change in permeability of the seed coat of *Xanthium* or a change in oxygen need of the embryo during the winter. It was believed that a careful measurement of the oxygen used by the seed would show which of these changes occurred, and a preliminary report is given of results obtained in studying the rôle of oxygen in the germination of this seed.

In the experiments the two lower seeds were placed in one chamber of the respirometer and the seed coats in the other chamber. In 22.5 hours the seeds used 0.475 cc. of oxygen, while the seed coats used 0.098 cc., indicating that possibly the seed coats were partly responsible for the respiration of the intact seeds. Later the respiration of the lower and upper seeds under atmospheric conditions was compared, and finally in atmospheres of oxygen. It was found that the two lower seeds in the atmosphere used 0.687 cc. of oxygen in 42.3 hours, while the same number of lower seeds used 1.007 cc. in 12.5 hours in 95 per cent oxygen. The upper seeds used 0.509 cc. in 43.2 hours in the atmosphere, and 0.4406 in 12.5 hours in 96 per cent oxygen.

This seems to indicate that an increase in the oxygen supply brings about an immediate and rapid increase in the rate of oxygen absorption and an immediate germination of the seeds. The author states that, owing to the complexity of the oxygen rôle in physiological processes, it is difficult to say which function or functions are affected. It seems certain, however, that the oxygen acts as a limiting factor on some function. The exact method by which the absence of oxygen delays germination, it is said, can be determined only by further investigation.

Studies on the assimilation of atmospheric nitrogen by yeast and fungi, P. LINDNER and C. W. NAUMANN (*Wehnschr. Brau.*, 30 (1913), No. 47, pp. 589-592).—Reviewing briefly recent contributions in this connection and discussing repeated tests made with *Endoblastoderma salmonicolor*, *Saccharomyces farinosus*, and *Oidium lactis*, the authors conclude that in the experiments cited atmospheric nitrogen was not assimilated by these forms.

The relation between the transpiration stream and the absorption of salts, H. HASSELBRING (*Bot. Gaz.*, 57 (1914), No. 1, pp. 72, 73; *abs. in Science*, n. ser., 39 (1914), No. 998, p. 259).—An account is given of some experiments conducted by the author during the winter of 1908-9 while connected with the experiment station in Cuba. These were carried on with tobacco plants under cheese-cloth shade and in the open to determine the comparative transpiration of tobacco plants.

The plants grown in the open absorbed about 23 per cent more water than those grown under shade. The plants which absorbed and transpired the greater quantity of water contained the smaller percentage and the smaller absolute quantity of ash. It appears from these experiments that the absorption of salts by roots is independent of the absorption of water and that the

transpiration stream does not exert an accelerating effect on the entrance of salts.

Influence of the salts common in alkali soils upon the growth of rice plant, I-IV, K. MIYAKE (*Bot. Mag. [Tokyo]*, 27 (1913), Nos. 321, pp. 173-182; 322, pp. 193-204; 323, pp. 224-233; 324, pp. 268-270).—The author carried out a number of tests regarding the influence upon the growth of young rice seedlings exerted by chlorids, nitrates, sulphates, and carbonates of sodium, calcium, magnesium, and potassium usually found in alkali soils, the conclusions from which may be summarized as follows:

The alkali and related salts, tested singly, proved to be toxic or stimulating according to concentration, each having its maximal points; but tested in combination with each other, their toxic effects may decrease or even disappear, in some cases given the antagonistic action of salts (otherwise toxic to the plant) for each other being ascribed to the influences of the ions present owing to the dissociation of the salts. The curve of antagonism between sodium and potassium salts shows two maxima.

Mutation in *Penicillium glaucum* and *Aspergillus niger* under the action of known factors, H. J. WATERMAN (*K. Akad. Wetensch. Amsterdam, Proc. Sect. Sci.*, 15 (1912), pt. 1, pp. 124-128).—Studies carried out with cultures of *P. glaucum* showed that this fungus exhibits mutations when cultivated in the presence of any one of several acids tested, as evidenced by differences in odor, tenacity, number of spores, etc. Experiments with *A. niger* showed enormous differences in metabolism of three strains obtained. It is claimed that by the methods employed it is possible to show the existence of mutations even when visible external differences between the cultures are lacking.

Action of hydrogen ions, boric acid, copper, manganese, zinc, and rubidium on the metabolism of *Aspergillus niger*, H. J. WATERMAN (*K. Akad. Wetensch. Amsterdam, Proc. Sect. Sci.*, 15 (1912), pt. 1, pp. 753-764).—Reporting the results of studies on metabolism, the author states that mutation was again apparent in the behavior of *A. niger* in cultures containing one or more of these components. Metabolism was but little or not at all influenced by addition of sulphuric acid or zinc and copper salts (the latter counteracting spore formation). Manganese acted favorably on the rapidity of spore formation. Rubidium, substituted for potassium, reduced spore formation but increased mold weight. This action is not considered as necessarily favorable, as in certain concentrations of copper sulphate, zinc chlorid, and zinc sulphate, a resulting increase of weight is inversely proportional to spore formation.

Relations of lipoids to differences in the electrical potential in plant organs, J. LOEB and R. BEUTNER (*Biochem. Ztschr.*, 51 (1913), No. 4, pp. 288-299).—The authors summarize the conclusions reached as the result of this study, in the claim that differences of potential noted in certain living plant organs are determined by the presence of a superficial layer of phosphatids or of allied substances not readily soluble in water. Variations in the characters of these, as regards their solvents, are related to the electrical differences noted.

Influence of anesthetics on superficial differences of electrical potential in plant and animal tissues, J. LOEB and R. BEUTNER (*Biochem. Ztschr.*, 51 (1913), No. 4, pp. 300-306).—Claiming to have shown, in previous communications cited, that the differences of potential observable between unwounded surfaces of plant organs and aqueous solutions of salts, present sharply defined and reversible alterations with differences in concentration of the latter, also that nonelectrolytes, as sugar and urea, show no such behavior, the authors report results of further study regarding the influence of several anesthetics, etc., in connection with constant concentration as regards the salt content, employing therein leaves of rubber plant or apple and muscles of the frog.

Along with more specific conclusions it is stated that considerable additions of alcohol or ether produce a reversible lowering of the potential difference between the living organ and the aqueous solution. This, it is thought, may be related to a change from a soluble to an insoluble phase in case of ether. The differences were more marked in case of vegetable tissue than in the experiments with animal tissue.

Comparative histology of alfalfa and clovers, KATE B. WINTON (*Bot. Gaz.*, 57 (1914), No. 1, pp. 53-63, figs. 8).—On account of the common use of alfalfa and clovers for preparing alfalfa meal, the author has made a study of the different species and has presented a scheme for the identification of alfalfa, red clover, and alsike clover, based on the characters of the epidermal cells and the unicellular hairs of the leaf.

On the mode of inheritance of certain characters in double-throwing stocks, EDITH R. SAUNDERS (*Ztschr. Induktive Abstam. u. Vererbungslehre*, 10 (1913), No. 4, pp. 297-310).—The author replies to a criticism of reports of some of her work on the inheritance of doubleness in flowers (*E. S. R.*, 26, p. 433; 30, p. 330), claiming that sex-limited inheritance can not explain the phenomena of inheritance of doubleness and of plastid color in stocks.

Mutation in tobacco, H. K. HAYES and E. G. BEINHART (*Science*, n. ser., 39 (1914), No. 992, pp. 34, 35).—The authors give a description of a variation that appeared in 1912 in a field of Connecticut shade-grown tobacco. The variety of tobacco known as the Cuban had been grown since 1904 in the Connecticut Valley, and in 1912 over 100 acres of tobacco was grown from the seed of the 1910 crop at the Windsor Tobacco Growers' Corporation. When the crop was harvested a plant was noticed that was much taller than the others and bore a large number of unpicked leaves. This plant, together with two others that were later discovered, were transferred to the greenhouse of the Connecticut State Station and there produced considerable seed. In 1913 about 5,000 plants were grown from this seed and these were all true to the new type.

In 1913 a planting was again made of 200 acres of plants from the original 1910 seed, and although a thorough search was made no mutating plants were discovered. Two mutants were found at other plantations, however, that presented the same character as that described above. Other mutations have been found, indicating that the same mutation must have taken place several times.

Breeding medicinal plants, F. A. MILLER (*Amer. Jour. Pharm.*, 85 (1913), No. 7, pp. 291-301, figs. 5; *Lilly Sci. Bul.*, 1. ser., No. 4 (1914), pp. 127-135, figs. 4).—An account is given of experiments made to secure more uniform strains with higher alkaloid content of belladonna (*Atropa belladonna*), henbane (*Hyoscyamus niger*), stramonium (*Datura stramonium* and *D. tatula*), and digitalis (*Digitalis purpurea*). In connection with the last comparisons were made of 32 species and varieties to determine their yield, cultural characters, flowering period, and the effect of hybridizing on these various characters.

On the apparent absence of apogamy in *Oenothera*, R. R. GATES (*Science*, n. ser., 39 (1914), No. 992, pp. 37, 38).—In 1909 the author described some experiments which suggested that *Oenothera* was occasionally apogamous. In 1912 experiments were again carried on, much more extensively than previously, the results of which were wholly negative, showing that if apogamy occurs in *O. lutea*, it must be very rare. The author also calls attention to a recently observed case of parthenocarpy in a race of *O. muricata*, in which capsules developed normally but contained undeveloped ovules instead of seeds.

Lectures on agricultural bacteriology, F. LÖHNIS (*Vorlesungen über landwirtschaftliche Bakteriologie*. Berlin, 1913, pp. VIII+398, pls. 10, figs.

60).—The general portion of these lectures deals with the morphology, development, cultivation, and powers of micro-organisms and means of combating injurious forms. The specialized portion deals with bacteriology pertaining to feeds, dairy products, soils, and fertilizers.

FIELD CROPS.

On the application of the method of least squares in agriculture, O. FRÖHLICH (*Mitt. Landw. Inst. Breslau*, 6 (1913), No. 5, pp. 683-703, fig. 1).—In this article the author discusses the arithmetical mean, observation errors, the measure of exactness, the law of large numbers, graphical comparisons, and the solution of normal comparisons, and illustrates these from actual practice.

On the application of the method of least squares, J. FRISCHAUF (*Landw. Jahrb.*, 43 (1912), No. 3, pp. 501-508).—This discusses the relation between the number of observations and the number of constants to be determined, and presents formulas for use in estimating the experimental errors, which are classed as "accidental" and "systematic" errors.

On the standing room of individual plants in plant breeding, E. A. MITSCHERLICH (*Ztschr. Pflanzenzücht.*, 1 (1913), No. 3, pp. 275-285, figs. 2).—The distance between individual plants to be used as breeders should be such as to avoid the influence of both the climatic vegetative factors and the neighboring plants. It is noted that the soil should be highly fertilized so as to reduce the possible inequalities in soil fertility. To get satisfactory results from the multiplication plats it is advised that they be 4 by 12.5 meters, arranged in series of 7 each, and repeated 4 times, so that number 1 shall be compared with number 7, 2 with 8, and 3 with 9, etc.

[Demonstration work] (*Philippine Agr. Rev. [English Ed.]*, 6 (1913), No. 6, pp. 279-296, pls. 5).—These articles comprise notes on crop selection, drainage, preparation of seed beds, methods of planting, soil improvement, and crop rotation, and include discussions of demonstration work in the Provinces around Manila by W. A. Mace; in Iloilo-Capiz by S. H. Sherard; in the island of Cebu by G. G. Weathersbee; in the Province of Batangas by H. T. Nielsen; and in the Mountain Province and Nueva Vizcaya by A. M. Burton.

[Reports on field crops] (*Union So. Africa Dept. Agr. Rpt. 1910-11*, pp. 21, 22, 29, 30, 229-253, 267-304, 453-466, 475-483, 515-518, 523-526, 541-544, 568-592, 603-615, 636-638, 641, 642, pl. 1).—These papers give summaries of continued work with tobacco, cotton, dry-land farming, maize, strawberry clover (*Trifolium fragiferum*) and other clovers, Tangier pea (*Lathyrus tingitanus*), Florida beggar weed (*Desmodium tortuosum*), serradella, Kanker-bosje (*Sutherlandia frutescens*), saltbushes (*Atriplex leptocarpa canescens*), blue grama (*Bouteloua gracilis*), Australian blue grass (*Andropogon sericeus*), sisal hemp, goats rue (*Galega officinalis*), sulla (*Hedysarum coronarium*), teff grass, alfalfa, thousand-headed kale, Mitchell grass (*Astrelba pectinata*), soy beans, Natal sugar beans, Rhodes grass, guinea grass, Kikuyu grass, spineless cactus (*Opuntia coccinellifera*), New Zealand flax, Algerian spinach (*Chenopodium amaranticola*), chayote (*Sechium edule*), Helianti, indigo (*Indigofera arrecta*), tree lucern (*Medicago arborea*), weeds, velvet beans, cowpeas, peanuts, grain inspection, root crops, potatoes, sugar cane, Kafir corn, wheat, native grasses, and oats.

New sources of nitrogen (*County Northumb. Ed. Com. Bul. 19 (1913)*, pp. 91, 92).—Slightly inferior yields of oats were obtained with calcium cyanamid than with sulphate of ammonia. With oats, hay, and mangels, nitrate of lime compared favorably with nitrate of soda.

Germination experiments with cereals in light and in darkness. A. BURGERSTEIN (*Ztschr. Landw. Versuchsw. Österr.*, 16 (1913), No. 8, pp. 849-861).—From experiments carried out in 1912 and 1913 the author concludes that cereal seeds germinate somewhat more slowly in diffused light than in darkness, but that light or darkness has little influence on the germinative ability. The temperature was maintained at between 18 and 20° C. It is noted that large oat seeds show a greater germinative energy than small ones.

Observations on cereals in trial plats. W. G. SMITH and T. ANDERSON (*Edinb. and East of Scot. Col. Agr. Rpt.* 30 (1913), pp. 26, pls. 3).—It is noted that when these plats were covered with a small mesh wire netting the ripening of the cereals was retarded more than 3 weeks in some cases, especially during cool wet seasons. It was found that, as a rule, grains of barley with a smooth rachilla produced plants with stronger straw and better grain than those from the same sample with a hairy rachilla. Two years' selection with barley did not seem to have any influence in reducing the number of spikes. In crossing barley it was observed that serrated dorsal veins of the kernels and the hairy rachilla appeared as dominant characters in the F₁ generation.

The influence of local conditions on the development of cereals with special reference to Göttingen variation. VON SEELHORST (*Jahrb. Deut. Landw. Gesell.*, 27 (1912), No. 2, pp. 374-386, pls. 4, fig. 1).—Similar work by Polle has already been noted (*E. S. R.*, 30, p. 136.)

The influence of different spacing on the growth of the plant. K. GRUNDMANN (*Deut. Landw. Presse*, 40 (1913), Nos. 71, pp. 846-848; 72, pp. 856, 857).—This article reports results of an investigation covering observations on the development of the plant, yield of grain, and character of the grain of wheat and rye as influenced by the spacing of breeding plants, so that each received from 36 to 200 sq. cm. From the results of 2 years' work the author concludes that a spacing of 5 by 20 cm. is the most favorable for selected plants which are to be used in breeding, and that a spacing of 3 by 20 cm. is the best suited for the multiplication plats.

Experiments bearing on feeding off cereal crops with sheep. A. J. PERKINS and W. J. SPAFFORD (*Jour. Dept. Agr. So. Aust.*, 16 (1913), Nos. 9, pp. 935-964, figs. 11; 11, pp. 1225-1238, figs. 5).—This gives results in tabular form of 3 years' experiments carried on to determine the effect produced upon yields by removing by pasturing or cutting the early growth of wheat, barley, and oats. The data show (1) that hay yields suffered by even judicious pasturing. (2) that in order to avoid lodging, pasturing was found advisable when there was an "overrank" winter growth, and that it should be done as rapidly as possible by crowding with sheep, (3) that pasturing should not be done in wet weather, late in the season, in frosty weather, and (4) that the percentage of smut in the grain was reduced by pasturing.

On the mechanics of the unfolding of the embryo of the Gramineæ. A. BURGERSTEIN (*Ztschr. Landw. Versuchsw. Österr.*, 16 (1913), No. 2, pp. 47-60, pl. 1).—This article discusses observations and results of experiments especially covering (1) the mechanical function of the first leaf sheath of cereals; (2) the mechanics of the unfolding of the radicle of cereals and legumes; (3) the abnormal germination of awned grass seeds; and (4) the mechanical function of the trichoma in the appearance of the Coleorrhiza. The grasses studied were *Lolium perenne*, *L. italicum*, *L. westerwoldicum*, *Poa pratensis*, *Arrhenatherum elatius*, *Alopecurus pratensis*, *Agrostis stolonifera*, *A. pratensis*, *Avena flavescens*, *Cynosurus cristatus*, *Dactylis glomerata*, *Festuca ovina*, *F. pratensis*, *F. rubra*, and *Holcus lanatus*.

New strains from the Alpine forms of pasture grasses. T. VON WEINZIERL (*Ztschr. Landw. Versuchsw. Österr.*, 16 (1913), No. 7, pp. 790-820, pls. 10,

figs. 2).—In this article the author gives his experience and the results obtained from about 20 years' experiments in the breeding of grasses, the principal ones being *Agropyrum caninum*, *Arrhenatherum elatius*, *A. bulbosum*, *Avena pubescens*, *Dactylis glomerata*, *Festuca arundinacea*, *F. pratensis*, *F. rubra*, *Lolium perenne*, *Poa serotina*, *Phleum medium*, *P. michelii*, and *Sanguisorba dodecandra*.

These grasses were greatly improved in yield of forage and of seed over the original strains, as well as over those produced from seed obtained on the open market. In some cases the yield of seed from the improved strains reached over 20 times that of the original forms, and the fodder was increased 10 times in other cases, with a general improvement in quality. It is noted that after the fourth year of breeding the seed yield again declined, due apparently to the close breeding.

On the changes in the composition of the red clover plant during different vegetative periods, E. HASELHOFF and ST. WERNER (*Landw. Jahrb.*, 44 (1913), No. 4, pp. 651-68).—In the work here reported Russian, northern French, southern French, and Hungarian clovers were used. Investigations were made of the plants when young, shortly before flowering, when in full flower, and at the end of the flowering stage.

It is stated that the Russian clover yielded more than the other sorts. With the advance of growth the proportion of leaf decreased, showing a corresponding increase in stem. There seemed to be little difference in the content of organic substances between any of the varieties. In mineral matter the Russian variety contained less calcium and magnesium but more potassium and phosphoric acid than the other 3 kinds. In general the leaves contained a higher percentage of nitrogenous substances and the stems a higher percentage of crude fiber. With increased age of the plants the content of protein substances, ether extract, and minerals decreased, while that of the crude fiber increased.

The greatest elaboration of organic substances seemed to take place during the second and third periods of observation; that of the protein substances took place at a slightly earlier stage, that of the fats later, while that of the nitrogen-free extract matter and crude fiber continued throughout the entire vegetative period. The increase in percentage of mineral matter ceased during the flowering stage and later declined. In the leaves the formation of organic matter, protein, and fat had ceased at the flowering stage, while in the stems elaboration continued somewhat later. The content of crude fiber in the stems was found to be greatest usually by the time the flowering stage was reached, while in the leaves it continued to increase to the end of the growing period. The increase of mineral matter in both stems and leaves was practically ended at the flowering stage. In the young plant the organic matter was chiefly in the leaves, in the older plants it was more in the stems, and toward the end of the vegetative period it was again found to be mostly in the leaves. Nitrogen and fat were found chiefly in the leaves. The nitrogen-free extract matter and crude fiber were principally in the leaves of the young plant, but in the older plant seemed to be stored in the stems. The same was generally true of the mineral matter. Calcium, magnesium, and phosphoric acid were chiefly in the leaves and potassium in the stems.

Data on yields and analyses are given in tabular form.

Trials with different strains of red clover at Svalöf, 1907-1912, H. WITTE (*Sveriges Utsädesför. Tidskr.*, 23 (1913), Nos. 1, pp. 51-64; 2, pp. 91-117).—This gives results of trials of wild red clover (*Trifolium pratense spontaneum*), cultivated red clover (*T. pratense sativum*), European red clover (*T. subnudum*), early red clover (*T. pratense præcox*), late red clover or single cut clover (*T. pratense serotinum*), and American red clover (*T. pratense expansum*). Swedish late red clover as a rule gave more satisfactory yields than

any other strain, either of native or foreign origin. The yield of 2 years' cropping of Swedish late was 58,730 kg.; of Swedish medium 56,570 kg.; and of Swedish early 49,500 kg. per hectare of green material.

The corn crops, E. G. MONTGOMERY (*New York, 1913, pp. XVII+347, figs. 121*).—This is a volume of the Rural Text-book Series, edited by L. H. Bailey, and treats of the production of corn and sorghum crops.

The author divides the subject of the study and philosophy of crop production into 4 phases, the first 2 of which, viz, (a) the plant, its structure, physiology, and normal requirements, and (b) a general survey of the region where it is proposed to cultivate the plant, in order to note how the natural conditions found correspond to the needs of the plant, are of a technical nature. The other 2 phases, (c) the adaptation of the plant to natural conditions on the one hand, and the adaptation of soil to the needs of the plant on the other, and (d) the necessity of protection against other indigenous plants, fungus diseases, and insects, are more practical and written in a more popular style.

Report of the work in corn pollination, III, M. L. FISHER (*Proc. Ind. Acad. Sci., 1911, pp. 283, 284*).—This reports work in continuation of that begun in 1908 and previously noted (*E. S. R., 28, p. 831*).

Some results of hand pollination were as follows: "The effect of using Reid Yellow Dent as a male on Boone County White was to increase the height of the stalk noticeably, while the reciprocal crops showed a sturdier stalk than is usual with either variety. Sweet corn as either parent induced an abundance of suckers. The average for 6 different rows in which the seed used had some sweet in it was 47.5 per cent of the stalks being suckers, some stalks having as many as 6 to 8. Also, where Reid Yellow Dent was the male, the percentage of suckers was large, amounting to 42.6 per cent of all the stalks, while the reciprocal gave only 9.6 per cent. It is well known that sweet corn normally produces many suckers, and under favorable conditions Reid Yellow Dent produces more than most dent varieties. The Sweet-Reid Yellow Dent and the Reid Yellow Dent-Boone County White crosses which had the largest percentage of suckered stalks also showed the largest percentage of twin ears and the smallest percentage of barren stalks. It may not be accepted that suckers are an indication of prolificacy, but this series of experiments indicated as much.

"This being the third year of the experiment, the constancy of dominants and recessives would be expected to show itself. Sweet, red, speckled, and white are supposed to be recessive to dent and yellow. In 18 self-pollinated ears from sweet, 15 were pure sweet and 3 mixed white, sweet, and yellow. In 12 ears from speckled seed, 9 were pure speckled, 2 pure yellow, and 1 pure red. In 15 ears from red seed, 13 were pure red and 2 pure yellow. However, in none of the pollinations from white seed was the percentage of pure ears so high, the highest being from the white seed selected from the Sweet-Reid Yellow Dent cross, in which 7 out of 12 ears were pure. In the experiments of 1908 yellow showed itself dominant to all other colors, consequently it would contain not only the dominants but the hybrids and such a condition manifested itself in the various selection from yellow seed. A notable exception was from a row planted with yellow seed from a twin ear. Every self-pollinated ear from this row was pure yellow. From the Sweet-Reid Yellow Dent cross 2 types arose, one with whitish kernels and white cobs, like the original Stowell Evergreen, and the other with yellowish kernels and red cobs. These 2 types were planted in 1911 on the grounds of the horticultural department, Purdue University. The season being backward the crop was not large, but enough was obtained to show that the types were fixed and would breed true."

Cotton and corn variety tests, R. J. H. DELOACH (*Georgia Sta. Circ. 70 (1914), pp. 3*).—Results of 20 varieties of cotton in 1913 showed Wannamaker

Cleveland to be the heaviest yielder, with 1,055 lbs. of lint cotton per acre, which was 37 per cent of the seed cotton yield. Seventy-six bolls of this variety made 1 lb. of seed cotton.

Of 19 varieties of corn Weekley Improved yielded 51.79 bu. per acre, showing 84 per cent of grain on the ear and 144 ears per bushel.

Local fertilizer experiments with cotton in south Alabama in 1913, J. F. DUGGAR, J. T. WILLIAMSON, and L. J. HAWLEY (*Alabama Col. Sta. Bul. 174* (1913), pp. 147-192).—Continuing previous work (E. S. R., 29, p. 335), the results showed that in 10 out of 23 conclusive experiments, cotton-seed meal was more effective than either acid phosphate or kainit. In 65 per cent of the experiments, acid phosphate was needed to a greater or less extent, while in 70 per cent kainit was needed to a greater or less extent.

The data also show that, as a rule, the complete fertilizers were more profitable than fertilizers applied singly or in pairs. In general it was more effective in all 3 years to apply 200 lbs. of kainit in a complete fertilizer than to use 100 lbs., although in 1911 a larger profit was made when 100 lbs. of kainit was used. The average of the conclusive experiments in both 1912 and 1913 showed that 200 lbs. of cotton-seed meal applied before planting was practically equal in effect to 100 lbs. of nitrate of soda applied after the plants were 6 in. high.

Papers on cotton (*West Indian Bul.*, 13 (1912), No. 1, pp. 1-55).—The following papers were read before the West Indian Agricultural Conference at Port-of-Spain, Trinidad, in January, 1912: The Results of the Cultivation of Cotton in St. Vincent, by W. N. Sands (pp. 1-10); The Cotton Industry in the Leeward Islands, by H. A. Tempany (pp. 11-13); The Cotton Industry in Barbados, by J. R. Bovell (pp. 13-21); Cotton Selection in Montserrat, The Manner of Cross-Pollination of Cotton in Montserrat, and Sakellarides Cotton in Montserrat, by W. Robson (pp. 22-28); The Cotton Boll Weevil, and Notes on Certain Cotton Pests, by H. A. Ballou (pp. 29-38); Outline of Manurial Experiments on Cotton in Tobago, by J. De Verteuil (p. 39); and Cotton Experiments in British Guiana, by J. B. Harrison (pp. 40-55).

Color correlation in cowpeas, W. J. SPILLMAN (*Science, n. ser.*, 38 (1913), No. 974, p. 302).—This gives some observations made in genetic investigations with cowpeas.

"The flower color, which is due to an anthocyan, and the anthocyan in stems and leaves are dependent on 2 Mendelian color factors, one of which, apparently an enzym, is the general factor for color in the seed coat of the cowpea. The other is the special factor for black, which when added to a variety having coffee-colored seeds converts the seed color to black. [The author has] found 3 independent Mendelian factors for 'eye' in the cowpea which, singly and together, give 5 distinct types of 'eye.' One of these factors, which gives the type of 'eye' which [he has] designated the narrow 'eye' also has the effect of inhibiting the development of anthocyan in the flowers, though it permits its development in stems and leaves."

Flax experiments, 1911 (*Dept. Agr. and Tech. Instr. Ireland Jour.*, 13 (1913), No. 3, pp. 515-534).—This article summarizes the results of the flax experimental work in Ireland from 1905 to 1910 inclusive, and reports the continuation of the work for 1911 which was carried on at 10 centers.

Muriate of potash applied at the rate of 1 cwt. per acre increased the yield of straw and fiber to a profitable extent, and the percentage of scutched flax was higher and of better quality than that from the unmanured plats. The combination of muriate of potash and sulphate of ammonia also gave increased yields, but at less profit than the muriate of potash alone. The addition of steamed bone flour did not give satisfactory results in either

increased yields or profits. The results of seed selection showed an improvement in quality and quantity of fiber. Variety tests, including seeds from Russia, are reported in tabular form.

Breeding *Linum usitatissimum* for fiber, N. DJAKONOW (*Trudy Būro Prikl. Bot. (Bul. Angew. Bot.)*, 6 (1913), No. 6, pp. 361-374).—Results of breeding flax in 1911 and 1912 in Pskow showed (1) that the height of the plants had little influence on the fiber yield; (2) that the thickness of the stem bore a direct relation to the fiber yield, which increased with the size of the stem; (3) that the maximum yields produced minimum waste products; (4) that with parents having uniformity in thickness of stems the first generation of those high in fiber content were high yielding and those of low yielding parents were low yielding; and (5) that Friebes' method of retting with pure cultures proved satisfactory. This method of retting is described.

The growing of linseed for feeding purposes (*Jour. Bd. Agr. [London]*, 20 (1913), No. 5, pp. 377-385, fig. 1).—In commenting upon the growing of flaxseed as a feed, a discussion is given as to the kinds to sow, the soil, rotation, manuring, chaff, time, method, rate and depth of sowing, cultivation, harvesting, threshing, and value of the straw. The yields of 22 varieties are reported which range from 1,042 to 1,840 lbs. seed and from 1,080 to 3,492 lbs. straw per acre, the length of straw ranging from 10 in. to 3 ft.

The following table shows analyses of flaxseed grown in England from seeds from different sources:

Composition of flaxseed grown in England from different sources.

Constituent.	Calcutta.	Morocco.	Odessa.	Steepe.	Turkey	Berdiansk.
	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>
Albuminoids.....	22.12	23.00	23.50	20.81	22.12	21.56
Oil.....	36.13	38.36	39.65	30.23	35.09	30.26
Soluble carbohydrates.....	18.36	19.49	18.58	17.31	18.65	19.52

The following reasons are given showing why the farmer should grow his own flaxseed: "(1) As a feed for stock it can be grown more cheaply than it can be purchased on the open market, and calves may be more economically reared; (2) it allows of the profitable employment of land which, owing to lateness of the season, can not be sown with spring crops; (3) in a dry early season it can be removed in time to allow of a catch crop being taken."

Report on the manuring of mangels, J. PORTER (*Herefordshire County Council Farmers' Bul.* 8 (1912), pp. 8).—Results are reported which show that top-dressing of mangels with 1 cwt. of nitrate of soda per acre, just after thinning, gave a handsome profit. Nitrate of soda proved more effective than nitrate of lime as a fertilizer, the average yields per acre being 31 tons 16½ cwt. and 29 tons 2¼ cwt., respectively. A proprietary fertilizer, analyzing 10½ per cent ammonia and 16 per cent insoluble phosphates, also proved beneficial. The largest yields of mangels and the largest profits were obtained by using the following mixture, applied per acre just before sowing the seed: Two cwt. nitrate of soda in two top-dressings; 1 cwt. sulphate of ammonia; 4 cwt. superphosphate (30 per cent soluble); ¾ cwt. sulphate of potash (48½ per cent potash); and 3 cwt. salt.

Commercial seed potato selection, D. DEAN (*Amer. Agr.*, 92 (1913), No. 13, pp. 3, 4, fig. 1).—This describes the method of selection of seed potatoes on a commercial scale by the author since 1904. The yield of marketable tubers

was the only basis of the hill method of selection used, choice being made by the use of scales. Tubers from high-yielding hills produced 350 bu. per acre as against 70 bu. by tubers from low-yielding hills. Small tubers were found to be unprofitable as seed. Increased yields, improved market qualities, uniformity in maturing, and resulting increased profits are noted as advantages of hill selection of seed potatoes.

The branching of rice, N. NOVELLI (*Staz. Sper. Risicol. Vercelli* [Pub.], 1913, pp. 3-11, figs. 4).—From his experiments and observations the author concludes that this is not a very frequent occurrence, that it is detrimental to the crop, and that it may be caused by irregularity in assimilation, by suppressed vegetative development, or by excessive height of water during stooling.

The economics of paddy planting, N. W. BARRETT (*Agr. Bul. Fed. Malay States*, 1 (1913), No. 12, pp. 443-446).—This article describes the aboriginal methods of rice cultivation and gives the itemized cost of production and value of the product for 2 classes of soil. The estimated cost ranged from \$51.20 to \$91.20 per acre, depending upon the quality of soil and the method employed, while the value of the product ranged from \$60 in the first instance to \$40 in the second or poorer soil. However, it is stated that a family cultivating their own land could be supported for about a year by the labor of 3 persons for from 35 to 65 working days.

The practical significance of the beet leaf, H. PLAHN-APPIANI (*Centbl. Zuckerindus.*, 21 (1913), No. 46, pp. 1678-1680).—This article reviews literature on this subject, and as the results of the author's observations it is noted that the higher the percentage of leaf growth to root the more favorably did the sugar formation in the beet seem to be influenced. The optimum relation varied with the physiological characters and anatomical structure of the leaves of different varieties, which, through the number of stoma and varied activities of the chlorophyll bodies, seemed to cause chemical elaborations differing in degree.

Sugar beets in North Dakota, J. W. INCE (*North Dakota Sta. Rpt. 1912*, pt. 1, pp. 11-28).—This report gives detailed results of cooperative sugar beet culture trials in 1911 and 1912, which include analyses and cultural data as to about 50 samples. A summary of the results of tests since 1891, comprising 385 trials, shows a range of sugar content of from 9.81 to 16.3 per cent, with an average of 12.46 per cent, and a purity coefficient ranging from 74 to 83 per cent, with an average of 76 per cent.

Sugar-beet experiments, 1912 (*Dept. Agr. and Tech. Instr. Ireland Jour.*, 13 (1913), No. 3, pp. 469-480, pls. 2).—This gives the results of cultural experiments in which a method of "molding up" the beets after hoeing gave a better yield of beets with higher sugar content and a higher average coefficient of purity than either ordinary drills or flat cultivation. One hundred and fifty lbs. of nitrate of soda per acre as a top-dressing apparently increased the average yields in the several methods of cultivation, but slightly lowered the content of sugar and impaired the purity of the flat cultivated product. Tabulated results of cooperative experiments with farmers show yields ranging from 1 ton 2 cwt. to 18 tons 14 cwt. per acre, with a sugar content ranging from 15.7 to 19.8 per cent.

Manurial experiments on sugar cane, J. DE VERTEUIL (*Dept. Agr. Trinidad and Tobago Bul. 11* (1912), No. 71, pp. 133-138).—In experiments on 4 estates in which sulphate of ammonia, nitrate of soda, superphosphate of lime, sulphate of potash, bone meal, calcium cyanid, basic slag, and air-slaked lime were used in the production of sugar cane, the best yields, on one estate, 44.83 tons per acre, resulted from the use of 200 lbs. sulphate of ammonia and 100 lbs. sulphate of potash. On another estate 18.39 tons were obtained from the use of

200 lbs. basic slag and 200 lbs. nitrate of soda; on the third 25.39 tons from 400 lbs. calcium nitrate and 100 lbs. superphosphate of lime; and on the fourth 30.83 tons from 200 lbs. sulphate of ammonia, 100 lbs. bone meal, and 50 lbs. sulphate of potash. Analyses are given of the cane juice from 2 of the estates.

Sugar cane in South Africa, H. J. CHOLIS (*Agr. Jour. Union So. Africa*, 5 (1913), Nos. 2, pp. 188-204, fig. 1; 3, pp. 405-418; 4, pp. 575-583; 5, pp. 746-753).—The author describes methods of propagation, field operations, etc.

Experiments on manuring tobacco in Hungary, K. KERPELY (*Dohány Njság*, 30 (1913), No. 2, pp. 2-4; abs. in *Internat. Inst. Agr. [Rome]*, Mo. Bul. Agr. Intel. and Plant Diseases, 4 (1913), No. 3, pp. 411-413).—In these experiments improvement in the combustibility of the leaves was noticeable, which was attributed to the use of nitrate of soda in 2 applications, after the first and second hoeings. Lime from sugar factories resulted in increased yields from a soil that contained 0.112 per cent of lime.

Yield and quality in wheat, A. and GABRIELLE L. C. HOWARD and H. M. LEAKE (*Agr. Jour. India*, 8 (1913), No. 2, pp. 128-138, fig. 1).—This compares the advantages derived from wheat growing by hot weather cultivation, which conserves the moisture after the monsoons, with those from drainage, which prevents "water logging" of the soil during the monsoons. The former method increased the wheat yield from 32.02 to 37.89 bu. per acre in 1910, and from 22.9 to 35.41 bu. in 1911, while the method of drainage increased the yield from 15.55 to 34.45 bu. per acre. The large yields were invariably of better quality than the others.

Wheat storage, T. SANDESON (*North Dakota Sta. Spec. Bul.*, 2 (1913), No. 26, pp. 350-352).—Winter and spring wheats stored in bins usually showed a continual loss in weight up to 4 years, due to moisture and to wearing off of seed coat in handling. The losses ranged up to 2.54 per cent, but in some cases there was a slight increase in weight. Data on 34 samples are given, in some cases covering 4 years.

The change in weight of grain in arid regions during storage, F. S. HARRIS and G. THOMAS (*Utah Sta. Bul.* 130 (1914), pp. 305-313, figs. 10).—Results of storing wheat and oats in sacks and weighing every month for 2 years show that "contrary to popular opinion, there is a gain of from 2½ to 4½ per cent instead of a loss in the weight of grain during the fall after harvest. While this holds for Cache Valley, Utah, other conditions would probably not give just the same results. . . . The method of raising or harvesting grain did not seem to have as much effect on the change in weight as the temperature and humidity. In every case there was a gain in weight during the winter, and a loss during the summer, but the grain weighed less at threshing than at any time later."

Salting Canada thistles, A. J. BLACKMAN (*Breder's Gaz.*, 64 (1913), No. 8, p. 311).—This describes a successful method of eradicating this weed by the application of salt to the plant while it is moist with dew or rain.

HORTICULTURE.

Making special crops pay, D. UTTER (*New York, Springfield, Mass., and Chicago*, 1913, pp. 60, pls. 16, figs. 2).—A practical treatise on the culture of the more important truck crops.

Truck crops for south Mississippi, E. B. FERRIS (*Mississippi Sta. Bul.* 163 (1913), pp. 24).—In order to show the results to be expected from growing various fruits and vegetables on the cut-over lands of south Mississippi, the author here summarizes the results that have been secured from experiments made at the McNeill substation.

Investigations in growing and picking cucumbers, I. K. KORNAUTH and F. ZANLUCHI (*Ztschr. Landw. Versuchsw. Österr.*, 16 (1913), No. 11-12, pp. 1025-1043).—This is the first report on investigations being conducted under the direction of the Vienna station for plant protection relative to methods of growing and preserving cucumbers. The data here reported deal principally with fertilizer tests and tests of different processes for pickling cucumbers.

Cultural experiments with truck crops: Experiments with garden peas from 1909 to 1912, inclusive, W. SCHULTZE (*Arb. Deut. Landw. Gesell.*, No. 253 (1914), pp. 69).—Tabular data are here given and discussed showing the results secured in cooperative tests of a number of varieties of peas grown for the canning factory.

Polymnia edulis, R. DE NOTER (*Jardin*, 28 (1914), No. 647, p. 36).—A cultural test made in 1912 of the "Poire de terre Cochet," or Yacon (*P. edulis*) of the Andes region of South America leads the author to conclude that although this plant was rejected some 50 years ago as a substitute for the Irish potato, it may prove of more value than the Jerusalem artichoke for French conditions. The tubers are prolific, of an agreeable flavor, and are as readily lifted from the soil as a clump of dahlia tubers, which they closely resemble. Moreover, the foliage appears to have value as a fodder crop.

Cold storage of fruit and vegetables, L. A. BOODLE (*Roy. Bot. Gard. Kew, Bul. Misc. Inform.*, No. 1 (1914), pp. 11-16).—A review of Hill's investigation relative to the respiration of fruits and growing plant tissues in certain gases, with reference to ventilation and fruit storage (*E. S. R.*, 29, p. 538).

Annual report of the South Haven Experiment Station, F. A. WILKIN (*Michigan Sta. Rpt. 1913*, pp. 179-182).—A brief statement is given of variety tests of fruits and nuts at the station, together with some data secured in 1913 on a comparative test of sod mulch and cultivation started in 1907 in blocks of European plums, Japanese plums, and apples. The results indicate a difference in growth in favor of the cultivated trees which is becoming more evident every year.

With reference to spring frost injury to fruits in 1913, apples were not materially injured and the difference, if any, in the effect on varieties was very slight. Of the pears Bartlett suffered most and of the peaches Smock, Salway, and Kalamazoo were most affected. There was apparently no difference in the effect of frost on the varieties of cherries and plums.

Summary of the results at the horticultural experiment station, J. M. STEINBRECH (*Wyo. Bd. Hort. Spec. Bul.*, 1 (1914), No. 4, pp. 30-37).—Notes are given on varieties of fruits, arranged in the order in which they rank, which have been tested at the experiment station at Lander, Wyo.

[New varieties of fruit], N. E. HANSEN (*South Dakota Sta. Rpt. 1912*, pp. 32-34).—The author briefly describes the following varieties of fruit, together with one rose, which have resulted from the plant breeding experiments at the station and were introduced in the spring of 1912: Tokata, Kahinta, Oziya, and Teton plums, the Champa sand cherry and Cikana plum-sand-cherry, the Amur crab apple, and the Ohta raspberry; and the Tetonkaha rose.

Winter spraying with solutions of nitrate of soda, W. S. BALLARD and W. H. VOLCK (*U. S. Dept. Agr., Jour. Agr. Research*, 1 (1914), No. 5, pp. 437-444, pls. 2).—In the course of their investigations on the control of apple powdery mildew in the Pajara Valley, Cal., the authors found that certain crude oil emulsions used as dormant sprays had a marked effect in stimulating an increased vigor of the trees the following spring. As a result it was decided to try the effect of a strong solution of nitrate of soda as a winter or dormant spray.

On February 2, 1912, seven 12-year-old Yellow Bellflower apple trees were sprayed with a mixture composed of 50 lbs. of nitrate of soda, 7 lbs. of caustic

potash, and 50 gal. of water, the caustic potash being added to give the spray an insecticide value. About 7 gal. of spray were applied to each tree so that all of the small twigs were drenched. A check row of trees received no winter spraying and several rows of 7 trees each received various applications of crude oil emulsions and soaps. Likewise, to gain some idea of the effect of nitrate of soda used as a fertilizer, 50 lbs. were worked into the soil under one vigorous tree selected from the row adjoining the nitrate sprayed row. By April 7, the trees in the row sprayed with nitrate of soda and lye were well in bloom while those in the check row adjoining and in the remainder of the unsprayed orchard showed only an occasional flower fully opened. When the check row had reached full bloom the row sprayed with a solution of nitrate of soda and lye was practically out of bloom. At first there was relatively little difference in the advancement of the foliage of the sprayed and unsprayed branches. Later in the spring, however, the sprayed trees assumed a more vigorous, green appearance than the check trees. The tree which received 50 lbs. of nitrate of soda applied to the soil showed no greater vigor than the check trees.

The trees received essentially the same treatment during the summer and were practically free from insect pests. The 7 winter nitrate-sprayed trees produced a total of 40 boxes of apples as compared with a total of about 8 boxes for the check row of 7 trees. The single tree which received the 50 lbs. of nitrate as a soil fertilizer gave no increased yield, whereas none of the trees in the nitrate sprayed row failed to respond.

The experiment was enlarged in 1913 to include other nitrogen-bearing materials as well as potash and phosphoric acid sprays. A frost occurred at the time the fruit was setting which ruined the crop. Data were obtained, however, on the effect of the various sprays on the blossoming of the trees in the spring. Plats sprayed with nitrate of soda at the rate of 1 lb. to a gallon came into bloom earlier than the check trees. This effect was more marked in the cases in which the lye was added to the nitrate solution than when it was omitted. Caustic soda appeared to be just as effective as caustic potash. A solution of nitrate of soda at the rate of $\frac{1}{2}$ lb. to the gallon was less effective and a solution of $\frac{1}{4}$ lb. to the gallon had practically no effect. Nitrate of soda at the rate of 1 lb. to the gallon to which oxalic acid was added in the preparation of 50 lbs. to 125 gal. of solution produced results similar to nitrate of soda plus lye so far as hastening the blooming period was concerned. Lime nitrate, 130 lbs. in 100 gal. of water, and lime cyanid, 92 lbs. in 100 gal. of water, likewise stimulated an earlier blooming of the trees. The effects from sulphate of ammonia were much less marked than those from nitrate of soda. The various nitrogen-bearing fertilizer substances carried relatively the same quantities of nitrogen per gallon. Sulphate of potash had some effect in stimulating an early blooming, but double superphosphate did not. Common salt used at the rate of 68 lbs. to 100 gal. of water produced a distinct effect. Some cooperative experiments were conducted by growers in 1913 on Yellow Bellflower apples, sweet cherries, and pears.

From the results thus far secured in this work the authors conclude that nitrate spraying of normal trees has brought about an earlier blooming in the case of the Yellow Bellflower apple and various varieties of pears sprayed. The results on stone fruits have not been as striking as those on pears and apples. Aside from the effect on crop production there has also been a very noticeable improvement in the color, abundance, and vigor of the foliage. Observations of the original plat of 1912 indicate that the effects obtained by spraying with a solution of nitrate of soda may continue over to the second year. It is suggested that at least under certain conditions some varieties of apples and pears that are more or less self-sterile may have their crop production

materially increased by dormant spraying with solutions of nitrate of soda plus lye. On the other hand, attention is called to the danger of injury from frost that might result from forcing the trees into bloom earlier than normal.

A brief bibliography dealing with the forcing of woody plants is appended.

The pneumatic chisel applied to tree surgery, cutting out cankers, and pruning, G. H. COONS (*Michigan Sta. Rpt. 1913, pp. 173-175*).—The author here describes an adaptation of the pneumatic hammer with chisel attachments which has been found to work very satisfactorily in gouging out cankers, smoothing stubs of branches, and in opening cavities. When used as a substitute for the mallet and chisel the pneumatic chisel has done the work of 4 or 5 men. It is recommended for trial to tree surgeons, park boards and city foresters doing tree surgery work, and to fruit growers with large acreages. The necessary equipment is here described.

Spraying calendar for 1914, P. J. O'GARA (*Off. Path. Rogue River Valley [Oreg.] Bul. 12 (1914), pp. 12*).—This calendar contains concise directions for the control of various insect, animal, and fungus pests of the orchard, field, garden, poultry house, and home. Directions are also given for the preparation and use of insecticides and fungicides.

The practical control of apple diseases and pests, A. L. MELANDER (*Portland, Oreg., [1912], pp. 44*).—A popular spraying manual dealing with the identification and control of apple diseases and pests.

Apple orchard experiments, W. R. BALLARD (*Maryland Sta. Bul. 178 (1913), pp. 58, figs. 24*).—In the first part of this bulletin the author describes experiments which have been conducted in the station orchard. The larger part of the bulletin consists of a revision and extension of a previous station bulletin upon apple culture with special reference to Maryland conditions (E. S. R., 23, p. 242).

In the station orchard, which was planted in the spring of 1889, northern-grown varieties have been compared with those produced in Maryland nurseries. No striking variation has been noted in the growth or in the productiveness or quality of fruit of trees from different sources.

A test was started in 1901 in which the following treatments were included: Sod mulch, clean culture followed by a cover crop, and clean culture throughout the season followed by rye as a winter crop. This plan was continued until the orchard was removed in the spring of 1913. The effect of these treatments on the trees was not marked, except that the foliage on the sod plats turned light green earlier in the fall. There was little difference in the quality of the fruit, the sod plat being fully equal to the other plats. The author points out that the soil was of such a nature as not to be easily affected in dry seasons. Notes are given on varieties grown in the station orchard with reference to their behavior in this particular section, together with a table showing the blooming records of the varieties arranged in the order of their first bloom.

In connection with the cost of growing an apple orchard the statement of E. P. Cohill in the previous bulletin on apple culture has been extended to show the cost of starting and maintaining a 30-acre orchard for a period of 11 years. Although the orchard shows a deficit for the first 7 years, at the end of the eleventh year a net profit of nearly \$30 per acre per year was realized.

Seedlessness in apples as a result of the climatic conditions of Imperial Valley, California, C. NICHOLS (*Univ. Cal. Jour. Agr., 1 (1913), No. 5, pp. 9-11, figs. 2*).—The author calls attention to the prevalent seedlessness of apples and of some of the varieties of pears grown in the Imperial Valley. This phenomenon is attributed to the fact that they come into bloom when the weather is extremely hot and dry, consequently the pistils of the flowers dry up before the pollen reaches and has a chance to fertilize them, or it is pos-

sible that the hot dry weather shrivels and devitalizes the pollen, rendering it incapable of properly fertilizing the pistils. The fact that the apples proceed to develop without pollination is attributed to the extraordinary vigor of growth in the Imperial Valley.

The composition of irrigated and nonirrigated apples, J. S. JONES and C. W. COLVER (*Jour. Agr. Sci. [England]*, 5 (1913), No. 4, pp. 424-428).—In this paper the authors summarize the results secured with apples in their study of hardy fruits growing in both irrigated and nonirrigated sections (E. S. R., 29, p. 236).

Peach culture, C. F. NIVEN (*South Carolina Sta. Circ.* 21 (1913), pp. 3-11).—This circular contains popular directions for starting and caring for a peach orchard.

The pollination and fertilization of pear blossoms, E. E. PESSCOTT (*Fruit World Austral.* 15 (1914), No. 2, pp. 35-38).—In this article the author calls attention to the importance of cross-pollination and the presence of insects for securing abundant crops of pears, and presents data secured in 5 different seasons showing the various pears which bloom concurrently with important varieties grown in Victoria.

The vine in ancient times, R. BILLIARD (*La Vigne dans l'Antiquité. Lyon*, 1913, pp. VIII+560, pls. 16, figs. 181).—An account of the vine and vine husbandry in ancient times, the subject matter being based upon an extensive bibliographical research as well as archeologic explorations in various countries.

In part 1 consideration is given to the paleontology, prehistory, and mythology of the vine; vineyards and wines of antiquity; some vicissitudes of ancient viticulture; economic phases of ancient viticulture; legal phases of the exploitation of the vine in Greece and in Italy; and commerce and uses of wine. In part 2 ancient viticulture is compared with modern viticulture, consideration being given to climate and soil; methods of reproduction; vineyard management; varieties; cultural practices with respect both to soil and vines; insects and diseases; wine pressing; wine making; and storage of wines.

A bibliography of cited literature is included.

Viticulture in the sandy soils of Mexico, J. DE BÁNÓ and M. SANTA-MARIA (*La Viticultura en los Terrenos Arenosos de la Republica Mexicana. Mexico*, 1913, pp. 131, pls. 49).—A practical treatise on the production of table, wine, and raisin grapes, prepared with special reference to extending the industry in the sandy soils of Mexico.

The American cranberry, P. BOODT (*Dept. Landb., Nijv. en Handel [Netherlands], Verslag. en Meded. Dir. Landb.*, No. 6 (1913), pp. 138-156, fig. 1).—A general descriptive account is given of the cranberry and its culture in America, together with an account of the present status of cranberry culture on the island of Terschelling.

Citropsis, a new tropical African genus allied to Citrus, W. T. SWINGLE and MAUDE KELLERMAN (*U. S. Dept. Agr., Jour. Agr. Research*, 1 (1914), No. 5, pp. 419-436, pl. 1, figs. 7).—A botanical study of Engler's subgenus Citropsis which includes the African species of Limonia.

In the light of their own investigations the authors conclude that these African cherry oranges, as they are here called, are related to Citrus rather than to the Asiatic species of Limonia. They have, therefore, raised the subgenus Citropsis to generic rank. Various species of Citropsis are here described.

Some grafting experiments conducted under the direction of the authors show that the Citropsis species can be budded easily and grown well on all the commonly cultivated species of Citrus. One species at least, *Citropsis schweinfurthii*, appears to be well adapted to poor, sandy soils in Florida, hence its

value as an additional stock for oranges is suggested. Although no hybrids of Citropsis and Citrus have been secured as yet, it has been demonstrated that *Citropsis schweinfurthii* will pollinize the flowers of the common lime (*Citrus aurantifolia*) and breeding experiments are now being carried on by using the pollen of Citropsis on as many species of Citrus as possible.

Citriculture in the Philippines, P. J. WESTER (*Philippine Bur. Agr. Bul.* 27 (1913), pp. 71, pls. 21, figs. 22; abs. in *Philippine Agr. Rev.* [English Ed.], 6 (1913), No. 10, pp. 471-492, figs. 9).—A popular treatise on citrus culture with special reference to Philippine conditions. The important phases discussed include geographical distribution and botany, citrus fruits cultivated in the Philippines, recent introductions, propagation, field culture, windbreaks, harvesting and marketing, plant parasites, diseases, and insect pests and their control.

Cacao culture, O. W. BARRETT (*Philippine Agr. Rev.* [English Ed.], 7 (1914), No. 1, pp. 5-15, figs. 4).—A brief popular treatise on cacao culture in which consideration is given to locations, soils, seed selection, transplanting, culture, pruning, harvesting, fermentation, and pests and diseases.

The buddage of cacao, P. J. WESTER (*Philippine Agr. Rev.* [English Ed.], 7 (1914), No. 1, pp. 27-33, pls. 2).—Popular directions are given for shield budding cacao trees.

Manurial experiments on coconuts, 1912-13, J. DE VERTEUIL (*Bul. Dept. Agr. Trinidad and Tobago*, 13 (1914), No. 77, pp. 1-7).—This report deals with the second year's results of the cooperative manurial experiments on coconuts under the control of the Trinidad Board of Agriculture (E. S. R., 29, p. 746).

Studies in Juglans.—I, Study of a new form of *Juglans californica*, E. B. BABCOCK (*Univ. Cal. Pubs. Agr. Sci.*, 2 (1913), No. 1, pp. 46, pls. 12).—The author here describes a new form of walnut, *J. californica quercina*, which has appeared on seven separate occasions among seedlings of at least three different trees of *J. californica*.

In studying the nature and origin of this new form of walnut the following three working hypotheses have been retained: Hybridization, teratology, and mutation. In connection with the hybridization study, seedlings of *J. californica* pollinated with three species of oak have been secured and will be further observed as to their possible hybrid nature. Thus far no definite conclusions are drawn from the investigation.

Multiplication of floral parts in the carnation, C. H. CONNORS (*Amer. Florist*, 42 (1914), No. 1343, pp. 272-275, figs. 16).—A study of the teratology of the carnation as observed in seedling forms resulting from crosses made by D. M. Jobbins at the New Jersey State Station. The variations are discussed under the following headings: Calycanthemy, phyllody, proliferation, petalody of the pistils, and pleiotaxy of the andræcium and petalody of the stamens.

Report on the plantations at Amani (*Pflanzer*, 10 (1914), No. 1, pp. 42-56).—This comprises brief notes on the various economic plants under observation at the Amani testing gardens.

Garden craft in Europe, H. I. TRIGGS (*London and New York, 1913*, pp. XI+332, pls. 16, figs. 295).—The successive chapters of this work, which deals with the development of ornamental gardening in Europe, discuss ancient gardens in Europe, the gardens of the Middle Ages, the Italian garden, French gardens of the sixteenth and early seventeenth centuries, La Nôtre and Versailles, French gardens of the later seventeenth and eighteenth centuries, garden designs in the Netherlands, English gardens of the sixteenth, seventeenth, and eighteenth centuries, German and Austrian gardens, garden design in Spain, and the English landscape school and its influence on the Continent.

A bibliography of selected works on European garden design is appended.

Improvement of school grounds, C. F. NIVEN (*South Carolina Sta. Circ.* 22 (1913), pp. 3-16, figs. 8).—In this circular the author presents two plans for school grounds and gives suggestions relative to laying out the grounds, grading, soil preparation, lawn making, the planting of hedges and trees, development and care of the school and flower gardens, and playgrounds.

FORESTRY.

Field manual of trees, J. H. SCHAFFNER (*Columbus, Ohio, 1914*, pp. 154).—A pocket guide for the identification of trees at any season of the year. The subject matter constitutes a revision and extension of the author's *Trees of Ohio and Surrounding Territory*. The region here considered includes southern Canada and the northern United States to the southern boundary of Virginia, Kentucky, and Missouri, and westward to the limits of the prairie. In addition to the native species, most of the common cultivated exotic trees have been included.

Profitable trees, A. HENRY (*Dept. Agr. and Tech. Instr. Ireland Jour.*, 14 (1913), No. 1, pp. 41-52).—This address delivered before the Irish Forestry Society discusses the adaptation of various exotic trees for commercial planting in Ireland.

Results of cultural experiments with foreign trees in the Royal Forest at Hambach (Jülich district), GERICKE (*Mitt. Deut. Dendrol. Gesell.*, No. 22 (1913), pp. 66-80, figs. 4).—Notes are given on the condition of a large number of American and Japanese species which have been planted at different periods since 1881.

Report on some cultural experiments with foreign timber species in Mecklenburg, VON BRONSART (*Mitt. Deut. Dendrol. Gesell.*, No. 22 (1913), pp. 88-96).—Notes similar to the above are given on a number of foreign timber species growing at Mecklenburg.

Some notes on Swedish forestry, A. C. FORBES (*Dept. Agr. and Tech. Instr. Ireland Jour.*, 14 (1914), No. 2, pp. 304-312, pls. 4).—The author discusses the importance of Swedish forestry, physical features and climate, forest areas and timber species in Sweden, methods of culture and management, and transit and utilization of timber.

Official proceedings of the division of forestry of the Royal Prussian Ministry for Agriculture, Domains, and Forests, 1912 (*Amtl. Mitt. Abt. Forsten K. Preuss. Min. Landw.* [etc.], 1912, pp. IV+47).—A statistical review of the administration, management, and exploitation of the Prussian state forests and domains.

Progress report of forest administration in the Andamans for 1912-13, J. L. BAKER (*Rpt. Forest Admin. Andamans, 1912-13*, pp. III+36).—This is the customary report on the administration of the state forests of the Andamans, including a financial statement for the year ended June 30, 1913. The more important data relative to forest areas, working plans, forest protection, miscellaneous work, revenues, yields, etc., are appended in tabular form.

Annual progress report on forest administration in the Province of Bihar and Orissa for the year 1911-12, H. H. FORTEATH (*Ann. Rpt. Forest Admin. Bihar and Orissa, 1911-12*, pp. 2+16+XXXIV+2+3).—This statistical report, corresponding to the above, relates to the administration of the state forests in the Province of Bihar and Orissa for the year 1911-12.

Progress report of the Forest Research Institute for the forest year, 1912-13, H. S. HOLE (*Rpt. Forest Research Inst. [Dehra Dun], 1912-13*, pp. 33).—This comprises a progress report of investigations in silviculture, forest

botany, forest economy, forest zoology, and forest chemistry. Lists of recent publications and of all publications issued since the institute was established are appended, together with summaries of the projects being conducted and a financial statement for the year.

Forest seed investigations, 1911-12, J. RAEN (*Mitt. Deut. Dendrol. Gesell.*, No. 22 (1913), pp. 273-280).—Germination tests of both coniferous and deciduous species, secured from various countries, are here reported.

Effect of "Johannistriebe" upon the formation of annual rings, H. L. SPÄTH (*Mitt. Deut. Dendrol. Gesell.*, No. 22 (1913), pp. 118-144, figs. 20).—A summary of the principal results secured in the author's studies of second growth phenomena (*E. S. R.*, 28, p. 340).

The cedar (*Juniperus virginiana*) at Stein-Nuremberg, R. FERLING (*Mitt. Deut. Dendrol. Gesell.*, No. 22 (1913), pp. 84-88, figs. 3).—The author here describes a 35-year-old red cedar plantation of about 15 acres in extent which was set out by L. von Faber to determine the adaptability of the species to German conditions, with special reference to the pencil industry. The growth performance to date appears to warrant the culture of red cedar, both as a forest tree and as an ornamental.

Rubber tapping experiments, I, A. ZIMMERMANN (*Pflanzer*, 9 (1913), No. 12, pp. 585-597).—This is the first report on some tapping experiments which are being conducted to determine the effect of different tapping intervals and different planting distances on the yield of rubber.

While no definite conclusions are drawn from the work thus far, the data presented indicate that although relatively higher yields are secured from frequent tapping and close planting these increased yields are secured at a sacrifice to the welfare of the individual trees. As the trees grow older those which are tapped less frequently during the year and are not too closely planted yield the most rubber.

Pricking or tapping, F. G. SPRING (*Agr. Bul. Fed. Malay States*, 2 (1914), No. 6, pp. 146-148).—For the purpose of making a comparison between the pricking and gouge methods of tapping rubber trees 100 4-year-old rubber trees in the Kwala Lumpur Government plantation were selected, 50 trees being tapped with the Northway pricker and 50 trees with a gouge knife.

The results show in general that, whereas the yield is about the same for either method, the pricking method of tapping is much more expensive and the proportion of expense is apt to increase as the trees increase in girth. Examination of the trees one year after cessation of tapping showed a satisfactory bark renewal on the trees which had been pricked.

The preparation of plantation rubber, S. MORGAN (*London*, 1913, 2. ed., pp. XII+269, pl. 1, figs. 7).—This book, which is offered as a reference work for practical planters, embodies much of the work undertaken on behalf of the Rubber Growers' Association by C. Beadle and Stevens during the first three years after the organization of the Malaya Research Fund. It also contains the work conducted by the author in the Malay Peninsula during that period.

The subject matter is discussed under the general headings of field operations, factory operations, machinery and buildings, the finished rubber, and general discussions.

The preservation of wood, A. J. WALLIS-TAYLOR (*Jour. Roy. Soc. Arts*, 62 (1914), No. 3196, pp. 286-315, figs. 12).—A review of our knowledge relative to the various treatments and processes employed in wood preservation.

About the value of wood-preserving substances containing fluorin, K. KROEMER (*Landw. Jahrb.*, 43 (1912), *Ergänzungsbd.* 1, pp. 173, 175).—A study of the disinfecting properties of silicofluoric acid, zinc silicofluorid, copper silici-

fluorid, kronoleum, antorgan, and a proprietary preparation consisting of silico-fluoric acid and zinc silicofluorid. A 3 per cent solution of silicofluoric acid was found to be more effective than a 3 per cent solution of kronoleum and antorgan or a 1 per cent solution of copper silicofluorid and zinc silicofluorid.

A siliceous wood preservative (*Sci. Amer.*, 108 (1913), No. 18, p. 401).—The Marr process consists in impregnating wood for the purpose of preservation with infusorial or diatomaceous earth suspended in paraffin and naphthalene for 4 hours. The advantage claimed over the paraffin-naphthalene process is that it penetrates the wood to the core. The mixture costs but 3 cts. per pound, and less than 2 lbs. are necessary per cubic foot of timber.

The artificial protection of wood with corrosive sublimate (kyanization), F. MOLL (*Ztschr. Angew. Chem.*, 26 (1913), No. 67, Aufsatzteil, pp. 459–463, figs. 6).—A historical review of the utilization of corrosive sublimate in the preservation of wood, together with a description of some modern kyanization plants.

DISEASES OF PLANTS.

Some little known but destructive diseases reported, L. CAESAR (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm*, 38 (1912), p. 28).—The author briefly describes raspberry yellows, a gooseberry disease said to be due to an undetermined fungus which enters the canes through openings made by insects, the mosaic disease of tomatoes, and a disease of pine branches due to a species of *Peridermium*, probably *P. cerebrum*.

The raspberry yellows is characterized by the curling and crumpling of the leaves, and plants that are attacked should be dug out and burned, as they are worthless. The presence of the mosaic disease of tomatoes may be recognized in the mottled appearance of the leaves, dark and light areas alternating. The causes of these troubles have not been determined.

[Report on plant diseases, 1911], JOHANNA WESTERDIJK (*Phytopath. Lab. "Willie Commelin Scholten" Jaarver. 1911*, pp. 21, pls. 2).—Besides brief mention of publications issued, notes are given of studies on diseases affecting beets, potatoes, onions, clover, etc., with treatments employed or suggested.

[Report on plant diseases, 1912], JOHANNA WESTERDIJK (*Phytopath. Lab. "Willie Commelin Scholten" Jaarver. 1912*, pp. 5–23).—This report, continuing that above noted, deals also with diseases of cucumbers, cress, orchard trees, etc.

[Observations on plant diseases], O. SCHINDLER (*Ber. K. Lehranst. Obst u. Gartenbau Proskau*, 1912, pp. 49–51, fig. 1).—Brief notes are given regarding a severe attack of *Monilia* on plum trees; on American gooseberry mildew attacking severely the more highly bred German gooseberry, the American varieties proving nearly immune thereto; and on leaf curl of peach.

[Plant injuries and diseases], R. EWERT (*Ber. K. Lehranst. Obst u. Gartenbau Proskau*, 1912, pp. 138, 140).—Brief notes are given regarding the direct influence of Bordeaux mixture on the sugar content in the sap of currants, gooseberries, and grapes; *Trichoseptoria fructigena* attacking quinces and apples in Germany; *Phytophthora syringæ* on lilacs; and injuries to vegetation by coal tar vapors.

Another host for *Rhodochytrium*, F. A. WOLF (*Phytopathology*, 3 (1913), No. 6, p. 311).—In addition to the host plants that have been reported for this parasitic alga by Atkinson (*E. S. R.*, 20, p. 550), the author reports having found it upon *Ambrosia trifida*, near Montgomery, Ala.

Nematodes or eelworms, G. MASSEE (*Roy. Bot. Gard. Kew, Bul. Misc. Inform.*, No. 9 (1913), pp. 343–351, pl. 1, fig. 1).—Besides a presentation of some general facts of parasitism, the author gives brief illustrated descriptions of the parasitic activity of *Heterodera radicola*, *H. schachtii*, *Tylenchus devasta-*

trix, *T. tritici*, *Aphelenchus fragariae*, and *A. olesistus* in relation to various economic plants.

New nematode genera found inhabiting fresh water and nonbrackish soils, N. A. COBB (*Jour. Wash. Acad. Sci.*, 3 (1913), No. 16, pp. 432-444, fig. 1).—Descriptions are given of 26 proposed new genera with a type species for each genus. About 73 per cent of these are found in arable soils in various parts of the world and nearly 50 per cent of them on the Arlington Farm of the United States Department of Agriculture. About 90 per cent are newly discovered forms, the rest resulting from further investigation of forms already described.

The chemical action of copper as used against cryptogamic diseases, E. PRISOVSKI (*Rev. Gén. Sci.*, 24 (1913), No. 21, pp. 787, 788).—This is a theoretical discussion of copper compounds as used against cryptogamic diseases and of the chemical processes involved, including the influence thereon of carbonic acid, ammonia, etc., in the air.

Cereal diseases and injuries in 1912, E. RIEHM (*Centbl. Bakt. [etc.]*, 2. Abt., 39 (1913), No. 4-7, pp. 81-107).—This is a very condensed review of contributions appearing in 1912, dealing with animal and other injuries, also parasitic and nonparasitic diseases of cultivated cereals and some uncultivated plants.

An extensive bibliography is appended.

Fungi causing foot rot of cereals in France, A. PRUNET (*Compt. Rend. Acad. Sci. [Paris]*, 157 (1913), No. 22, pp. 1079-1081).—The author states that foot rot or stalk disease of cereals, which is spreading in France, is caused ordinarily by one or more of three different fungi, *Ophiobolus graminis*, *O. herpotrichus*, and *Leptosphaeri herpotrichoides*, superficially much alike.

A disease of forage plants, P. BERTHAULT (*Bul. Soc. Agr. France*, 1913, Dec. 1, pp. 283, 284, fig. 1).—This is a brief discussion of *Pseudopeziza medicaginis*, which is said to have shown recently a tendency to cause serious damage to crops of alfalfa, clover, and sainfoin in parts of France.

Influence of artificial infection with dry rot on the sugar content of beets, L. GARBOWSKI (*Abs. in Bl. Zuckerrübenbau*, 20 (1913), No. 11, pp. 165, 166).—Contact of sound beets with portions of diseased ones is said to have resulted in very small differences in the sap as regards sugar content. The amount is thought to have been due largely to infiltration and to wounding of the roots employed.

Report on clover canker, E. HAACK (*Illus. Landw. Ztg.*, 33 (1913), No. 23, p. 218, figs. 2).—The author reports, from his district on the west side of the Rhine, severe damage from clover canker in 1913, preceded by dry summers in 1911 and 1912 with heavy precipitation in the fall of the latter year. A few varieties named were not seriously affected.

Cucumber rot, O. F. BURGER (*Florida Sta. Bul.* 121 (1914), pp. 95-109, figs. 6).—This is a detailed account of the author's investigations on the bacterial disease of cucumber, a preliminary report of which has been noted (*E. S. R.*, 30, p. 149).

In addition to describing the disease and its cause, the author gives an account of spraying experiments in which Bordeaux mixture was used for the control of the disease, and it was found that on thoroughly sprayed vines 17 per cent of the cucumbers were affected with the disease as compared with 35 per cent on the sprayed vines. In other experiments it appeared that irrigation and the application of nitrate of soda to cucumbers rendered them more susceptible to the trouble.

Diseases of flax, W. DALLMORE (*Roy. Bot. Gard. Kew, Bul. Misc. Inform.*, No. 9 (1913), p. 335).—The author mentions as rather troublesome at times in

England, flax wilt (*Fusarium lini*) and flax rust (*Melampsora lini*), recommending for the former continual rotation of crops.

Report of the professor of botany, J. E. HOWITT (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm*, 38 (1912), pp. 29-33).—The author investigated a number of ginseng gardens and found that the most serious diseases in Ontario are the Alternaria blight (*A. panax*), rust, fiber rot or end rot (*Thielavia basicola*), and a soft rot due to bacteria. These diseases are briefly discussed and, so far as definitely known, methods of prevention are indicated.

A method of treatment for mushroom root rot, H. P. BARSS (*Oreg. Countryman*, 6 (1913), No. 3, pp. 113-115, figs. 2).—Among the remedies recommended for this disease of fruit trees, due to *Armillaria mellea*, are the removal of all affected or dead roots and bark, disinfection with Bordeaux mixture, lime sulphur, corrosive sublimate solution, etc. After surgical treatment exposed surfaces should be protected with tree paint or grafting wax.

Fusarium leaf roll of potatoes, W. HIMMELBAUR (*Umschau*, 17 (1913), No. 50, pp. 1046, 1047, figs. 7).—This is a somewhat popular and partly graphical presentation of data, most of which have been noted previously (E. S. R., 28, p. 848).

Potato wilt, leaf roll, and related diseases, W. A. ORTON (*U. S. Dept. Agr. Bul.* 64 (1914), pp. 48, pls. 16).—On account of the confusion which exists among plant pathologists and others concerning a number of potato diseases commonly referred to as wilt, leaf roll, leaf curl, *Fusarium* blight, bacterial ring disease, etc., the author has undertaken to bring together the information relating to these diseases in order that they may be more readily differentiated.

The principal diseases discussed in this bulletin are the *Fusarium* wilt, due to *F. oxysporum*, which is said to be widespread in America, but not yet recognized from Europe; the Verticillium wilt, caused by *V. albo-atrum*, present both in America and in Europe; the leaf roll, which is considered an inheritable disease but probably not due to a parasite and which is common in Europe and has lately appeared in America; the curly dwarf, an inheritable, nonparasitic disease, found both in Europe and in America; the rosette, due to the fungus *Rhizoctonia*, which is very prevalent in the western United States; and the mosaic, which is a pathological condition present both in Europe and in America. These different diseases are described at some length and suggestions given for their recognition, and where known control measures are described. A bibliography is appended.

Influence of temperature on the spread of potato diseases, F. GAUL (*Deut. Landw. Presse*, 40 (1913), No. 92, p. 1094).—Referring to observations previously reported by Voges (E. S. R., 30, p. 541), the author states his belief that the drop in temperature from 14.5 to 10.3° C. about August 27, 1912, was largely instrumental in checking the progress of *Phytophthora* and in giving a fair crop of sound tubers notwithstanding the wet weather prevalent about that time.

Diseases and pests of the sugar beet in Bohemia and of the crops used in rotation, 1911, H. UZEL (*Ztschr. Zuckerindus. Böhmen*, 38 (1913), No. 3, pp. 133-140, figs. 2).—A brief account is given of observations made at the phytopathological section of the experiment station for the sugar industry at Prague for 1911, including notes on heart rot, dry rot, red rot due to *Rhizoctonia violacea*, etc., and a formation of teratological character affecting beets; also on *Puccinia glumarum* and *Urocystis occulta* on rye, nematodes attacking oats, and other animal pests on various crops employed in rotation.

Red rot of sugar cane, E. J. BUTLER and A. HAFIZ (*Mem. Dept. Agr. India, Bot. Ser.*, 6 (1913), No. 5, pp. 151-178, pl. 1).—This is in pursuance of previous reports by Butler (E. S. R., 18, p. 450; 19, p. 162) on red rot of sugar cane in

India due to *Colletotrichum falcatum* and held to be identical with the form attacking the leaves and stalk as noted in Louisiana by Edgerton (E. S. R., 26, p. 548).

It is stated that spread of infection from growing canes is rather unlikely in the absence of insect parasites, but that from dead and rotting canes the fungus may be carried to sound ones by soil or irrigation water, by the feet of workmen, or by the cane fly (*Pyrilla aberrans*). The fungus is said to enter the plant most readily at the eye, but leaves, stems, and shoots may be attacked, producing typical symptoms. Wounds also favor its entrance. Much of the damage by this fungus is due to inversion of cane sugar owing to the presence of invertase, which has been demonstrated both in the fungus and in the nutritive medium.

The disease is said to be less severe on the lighter canes. Care in selection to secure only sound cane, removal of plants showing infection, and long period rotation are preventive measures suggested.

Some new sugar cane diseases, E. J. BUTLER and A. HAFIZ (*Mem. Dept. Agr. India, Bot. Ser.*, 6 (1913), No. 6, pp. 181-208, pls. 6, fig. 1).—Continuing the above report on sugar cane diseases the authors describe three fungi. One associated with a cane wilt is named *Cephalosporium sacchari* n. sp. A second found in a collar rot is named *Hendersonina sacchari* n. g. and sp. A third, said to cause a leaf spot or streak, is named *Helminthosporium sacchari* n. sp. These are not known to cause much loss at present, but further investigations are in progress.

The importance of the tarnished plant bug in the dissemination of fire blight in nursery stock, V. B. STEWART (*Phytopathology*, 3 (1913), No. 6, pp. 273-276, pl. 1).—In a previous publication (E. S. R., 29, p. 348) the author called attention to the rôle of various insects in the dissemination of fire blight in nursery stock. The investigations previously described have been continued, and some experiments are reported on the tarnished plant bug (*Lygus pratensis*), which appears to be the most important insect in transmitting the blight to healthy trees.

In these experiments tarnished plant bugs were transferred from infected trees or were placed in contact with cultures of the organism and then transferred to sound trees. The results of the experiments make it evident that the tarnished plant bug is able to transmit the casual organism of fire blight from exuding blight lesions to healthy shoots.

Apple leaf spot (*Bd. Agr. and Fisheries* [London], Leaflet 281 (1913), pp. 4, figs. 4).—A brief description is given of *Sphaeropsis malorum* attacking the trunk, branches, leaves, and fruit of apple, pear, and quince in the United States and more recently in England.

Removal of dead branches and leaves, and spraying with half strength Bordeaux mixture about a week after the fall of the petals and again about a month later are recommended, as is also treatment with lime-sulphur wash.

Control of apple black rot, F. A. WOLF (*Phytopathology*, 3 (1913), No. 6, pp. 288, 289).—The apple black rot, due to *Sphaeropsis malorum*, is said to be becoming very destructive in certain commercial apple orchards in Alabama, and some experiments were carried on in 1912 and 1913 for its control.

In 1912 the trees were sprayed with lime sulphur, but it proved entirely ineffective against either the black rot or the bitter rot, irrespective of the time and number of applications. In 1913 the experiment was repeated, Bordeaux mixture being used as the fungicide. The first application was made about the middle of July and a second about two weeks later. Satisfactory results were obtained from this work, less than 1 per cent of the variety Champion being affected while from 85 to 90 per cent control was obtained with Black Ben Davis.

It is thought that this amount of loss could have been appreciably reduced had the sprayings been made earlier in the season.

Physalospora cydoniæ, L. R. HESLER (*Phytopathology*, 3 (1913), No. 6, pp. 290-295, pl. 1, figs. 2).—In connection with studies on the New York apple tree canker (*Sphaeropsis malorum*), attempts have been made to determine the parasitism of the fungus, its identity, the possibility of the existence of different strains, and the question of its perfect stage. In the present paper the results of an investigation on the perfect stage of the fungus are given.

Until 1913 unsuccessful efforts have been made to determine the ascogenous form of the fungus. In February some diseased apple twigs were received at the laboratory at Cornell University which later developed the immature ascomycete forms. Subsequent investigations have shown that the ascogenous form is a species of *Physalospora*, and with the data at hand the author is inclined to accept for it the name *P. cydoniæ*.

Rust of apple, N. J. GIDDINGS (*W. Va. Crop Pest Com. Bul.* 2 (1913), pp. 7-11, fig. 1).—This is a brief account of the life history of apple rust, with a discussion of the resistance shown by certain varieties thereto and protective measures studied, emphasizing the destruction of all cedars within a mile or so of apple orchards.

Note on *Plowrightia morbosa*, T. H. MACBRIDE (*Phytopathology*, 3 (1913), No. 6, pp. 311, 312).—The author reports the black knot fungus as universally present in Iowa on all sorts of wild plums but not on *Prunus virginiana* or *P. pennsylvanica*. Recently observations have shown that it also attacks the Juneberry (*Amelanchier canadensis*).

A severe outbreak of apoplexy of grapevines, FISCHER (*Ber. K. Lehranst. Wein, Obst u. Gartenbau Geisenheim*, 1912, pp. 216-219, figs. 2).—Discussing the spatial and other relations of grape stocks previously affected in various degrees, the author states that no stocks planted in 1912 suffered from this leaf scorch disease.

Court-noué in Austria, KOBER (*Prog. Agr. et Vit. (Ed. l'Est-Centre)*, 34 (1913), No. 51, pp. 779-781).—The author gives some results of observations on court-noué in Lower Austria made during 16 years, as related to stock, elevation, temperature, soil, etc. Along with more specific statements regarding the susceptibility of certain stocks or hybrids, the general conclusion is drawn that this trouble is more common in level vineyards of deep fresh soil, and particularly in those years in which circulation in the vines is checked by cold weather during the spring months.

Treatment for gray rot of grapes, A. MORUCHON (*Prog. Agr. et Vit. (Ed. l'Est-Centre)*, 34 (1913), No. 51, pp. 776-779).—This is a comparative study of the effects, when used in varying concentrations, of several common fungicides as protective against *Sclerotinia fuckeliana* (*Botrytis cinerea*), causing gray rot of grapes.

A destructive form of white rot of grapevines, A. TÉNÈS (*Bul. Agr. Algérie et Tunisie*, 19 (1913), No. 17, pp. 341, 342).—The occurrence of a disease affecting the petioles and peduncles is noted. The fungus associated therewith is said to be a *Phoma*.

Tests with powdered fungicides against *Peronospora* and *Oidium*, FISCHER (*Ber. K. Lehranst. Wein, Obst u. Gartenbau Geisenheim*, 1912, pp. 18, 19).—Three commercial preparations named are recommended, which are said to prove efficient without causing injury.

The possibility of reaching the underside of grape leaves with sprays, FISCHER (*Ber. K. Lehranst. Wein, Obst u. Gartenbau Geisenheim*, 1912 pp. 15-18, fig. 1).—Illustrated descriptions are given of several forms of nozzles

designed by the makers for the application of sprays to the underside of grape leaves, and their relative merits discussed.

Nematode disease of banana in Egypt, J. LAMBA (*Bul. Union Agr. Égypte*, 10 (1912), Nos. 83, pp. 17-21; 85, pp. 77-86).—Besides a brief account of the progress of the nematode disease noted as threatening the practical extermination of banana culture in Egypt, the author discusses the application and value of several treatments mentioned, such as employment of trap plants and of various insecticides, liquid and gaseous.

Coconut diseases, S. J. ASHEY (*Jour. Jamaica Agr. Soc.*, 17 (1913), No. 11, pp. 20-25).—In this report the author deals with die-back disease ascribed to a *Diplodia* attacking trees aged 15 years and upward; bud rot disease, thought to be identical with *Bacterium lactis ærogenes*; gummosis, ascribed to unsuitable soil conditions; and dwindling or pencil-point, of undetermined cause. Remedies are suggested for the control of the diseases.

Stilbum flavidum, a parasite of coffee and its systematic position, A. MAUBLANC and E. RANGEL (*Compt. Rend. Acad. Sci. [Paris]*, 157 (1913), No. 19, pp. 858-860; *abs. in Agron. Colon.*, 1 (1913), No. 6, pp. 179-181).—The authors state, as the result of a study of *S. flavidum* found on a considerable number of wild plants, that this parasite, which attacks coffee trees only under favorable conditions of heat and moisture, is the sterile form of a fungus which they have named *Omphalia flavida* n. sp. It is stated also that the parasite readily extends itself without the recurrence of the perfect form.

Black pit of lemon, C. O. SMITH (*Phytopathology*, 3 (1913), No. 6, pp. 277-281, pl. 1).—In continuation of a previous note (*E. S. R.*, 29, p. 650), the author states that for the past three years two of the chief commercial varieties of lemons, the Eureka and Lisbon, have shown the presence of a disease called black-pit. This trouble seems to be increasing and has assumed some economic importance. It develops on tree-ripe lemons during the spring months, and does not reappear during the remainder of the year.

A study of diseased fruits showed the presence of a bacterial exudation, and transfers were made both by punctures and by spraying. Almost without exception, successful inoculations followed the punctures in from 3 to 10 days, and in some instances the disease developed after the fruit was sprayed with the organism.

The organism which is held to be responsible for this trouble, *Bacterium citriputeale* n. sp., is technically described.

On some relations between *Puccinia malvacearum* and the tissues of its host plant (*Althæa rosea*), W. ROBINSON (*Mem. and Proc. Manchester Lit. and Phil. Soc.*, 57 (1913), pt. 3, No. 11, pp. 24, pls. 2, figs. 7).—The author has made a study of the intimate relation which exists between this fungus and the cells of the host, and gives a description of the histological features of the diseased spot as compared with the corresponding normal tissues.

It was found that the germ tube from the sporidium of *P. malvacearum* penetrates the epidermis of the hollyhock, sending an infection vesicle into the cell. Later, branches are produced which grow into the intercellular spaces, and the mycelium sends haustoria into the cells of the affected area. Strands of hyphæ were found to pass into the vascular bundles where they set up a definite attack on the phloem region. In the case of the leaf each pustule is related to several vascular strands. According to the author, there was a definite diminution in the quantity of starch in the regions invaded by the fungus, and the cells of the host plant were found to remain alive for a considerable time after the entry of the haustoria. The haustoria lie within the protoplasm and grow toward the nucleus. Various changes in the cell contents were noted on the entry of the haustoria. The chloroplasts lost their color and contour and

finally disintegrated. The nucleus moved from a peripheral position toward the center of the cell. There was also a distinct increase in the size of the nucleus while the chromatin gradually diminished in quantity.

Contributions to a knowledge of "the snap-beech" disease, ELSIE M. PRIOR (*Jour. Econ. Biol.*, 8 (1913), No. 4, pp. 249-263, pls. 2).—The author gives an account of studies made on a fungus disease of beech causing trees to break at a point usually 15 to 20 ft. above ground, the rest of the trunk remaining sound. The disease is attributed to *Polyporus adustus*, which is said to be a wound parasite. An account of its activity in this connection is given. Several enzymes named were present in the mycelium.

Chestnut blight and its control in West Virginia, A. B. BROOKS (*W. Va. Crop Pest Com. Bul.* 2 (1913), pp. 12-16, figs. 2).—This is a brief account of the history, distribution, and attempted control of chestnut blight in West Virginia. Radical sanitary surgery in case of trees valuable for shade, ornamentation, etc., and complete eradication of forest trees affected are measures insisted upon.

The relative prevalence of pycnospores and ascospores of the chestnut blight fungus during the winter, F. D. HEALD and M. W. GARDNER (*Phytopathology*, 3 (1913), No. 6, pp. 296-305, pls. 3).—A detailed account is given of a study of the dissemination of the pycnospores and ascospores of the chestnut blight fungus, a preliminary account of which has already been noted (*E. S. R.*, 29, p. 351). It was found that viable pycnospores of the chestnut blight fungus are washed down the trees in large numbers during every winter rain, but no ascospores were washed down by the rains during the period covered by the test.

Notes on oak mildew, E. NOFFRAY (*Bul. Soc. Nat. Agr. France*, 73 (1913), No. 6, pp. 474-477).—It is stated that in 1912 the attack of oaks by *Oidium quercinum* appears to have been less severe than in recent years. The American oak (*Quercus palustris*) continues to show greater resistance to attack by this fungus than do the native species.

[Destruction of coniferous seedlings by *Fusarium*], G. LÜSTNER (*Ber. K. Lehranst. Wien, Obst u. Gartenbau Geisenheim*, 1912, pp. 148-150, fig. 1).—A disease of conifer seedlings, causing in a short time a loss of 70 per cent of the plants, is briefly reported upon. The trouble is thought to be due to a *Fusarium*.

Production of secondary sporidia by *Gymnosporangium*, C. H. CRABILL (*Phytopathology*, 3 (1913), No. 6, pp. 282-284, fig. 1).—The author reports observing secondary spores formed by the germinating sporidia of *G. juniperi-virginianæ* while conducting some investigations on the cedar rust in 1913. Secondary sporidia have also been observed by him in *G. clavipes*, and it is thought that probably this phenomenon may occur in other species of *Gymnosporangium*.

Notes on *Cronartium comptoniæ*, II, P. SPAULDING (*Phytopathology*, 3 (1913), No. 6, pp. 308-310).—In a previous publication the author gave some data concerning the eastern pitch pine blister rust caused by the fungus *C. comptoniæ*. This fungus was not thought to be of economic importance, as it seemed at that time to be confined to a number of species of *Pinus* which have little value as timber trees. Later it was observed on *P. ponderosa*, and it is probable that it would prove a serious enemy of that species of pine should it ever be grown in any quantity in the East. *P. sylvestris* is also said to be a host of this fungus.

The introduction of a European pine rust into Wisconsin, J. J. DAVIS (*Phytopathology*, 3 (1913), No. 6, pp. 306, 307).—The author reports the occur-

rence of *Coleosporium sonchi-arvensis* on *Sonchus asper* in Wisconsin. This rust has for its Peridermium host some species of pine.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

A determination of the economic status of the western meadow lark (*Sturnella neglecta*) in California, H. C. BRYANT (*Univ. Cal. Pubs., Zool., 11* (1914), No. 14, pp. 377-510, pls. 4, figs. 5).—This is a more detailed report of studies previously noted from other sources (E. S. R., 29, p. 52). A bibliography of 157 titles is appended.

The western red-tailed hawk.—Has it a money value? H. K. DICKSON (*Univ. Cal. Jour. Agr., 1* (1913), No. 5, pp. 22-24, 33, fig. 1).—This paper includes an account of the habits and economic status of *Buteo borealis calurus*, known in California as the "squirrel hawk". It is estimated that an annual benefit of at least \$18.25 is derived from the destruction of ground squirrels by a single hawk.

A laboratory guide to the study of parasitology, W. B. HERMS (*New York, 1913*, pp. XV+72).—This guide is divided into 3 parts: (1) Medical entomology (pp. 1-44); (2) helminthology (pp. 45-68); and (3) life history studies on living parasites (pp. 69-72).

Thirteenth report of the state entomologist of Connecticut for the year 1913, W. E. BRITTON (*Connecticut Sta. Rpt. 1913, pt. 3, pp. VIII+181-256, pls. 12*).—The first part of this work consisting of financial and organization statements is followed by a discussion of the work of inspecting nurseries, imported nursery stock, and apiaries, and of gipsy and brown-tail moth control.

The importance of *Archips rosana* as a leaf folder on privet is discussed by B. H. WALDEN (pp. 223-226), who reports that this tortricid was the source of injury to many privet hedges in New Haven during May. Notes are given on its life history and habits. The tachinid parasite *Exorista pyste* was reared from the larvæ. The application of arsenate of lead at the rate of 2 lbs. to 50 gal. of water soon after the leaves unfold and removing and destroying the infested tips are mentioned as remedial measures. Mention is next made of the unusual abundance of the apple-tree tent caterpillar, a bulletin relating to which has been previously noted (E. S. R., 29, p. 655). Few complaints were received of injury by white grubs, which were extremely abundant in Connecticut the previous year. *Otiorhynchus sulcatus* was the source of considerable injury to Japanese yew in a nursery at Pomfret through devouring the small roots and girdling the larger ones and the main stem below the surface of the ground.

Field tests in controlling several insects attacking vegetable crops are reported by W. E. BRITTON and B. H. WALDEN (pp. 232-237). In experiments with the cabbage maggot it was found that on new ground plowed in the spring and thoroughly pulverized with the disk harrow cabbage plants about which tar paper disks were placed showed a much lower percentage of infestation than did the check plants. Blackleaf 40 applied August 15 at the rate of 1 teaspoonful to a gallon of water with soap added to act as a spreader destroyed all the cabbage aphids with which it came in contact. In spraying tests of the value of several insecticides in controlling the onion thrips only negative results were obtained, this being due in large part to an inability to penetrate the base of the leaves below the sheath which inclosed the thrips. In spraying tests of insecticides for the pea aphid (*Nectarophora pisi*) blackleaf 40 gave quite satisfactory results.

Attention is called to the fact that in southwestern Connecticut and in adjoining portions of New York State many hickory trees have died during the

past 2 or 3 years and many more have been injured, the hickory bark beetle or bark borer (*Scolytus quadrispinosus*) being the chief cause. Many thousands of trees are said to have been killed in the vicinity of New York City and in Connecticut, particularly in Fairfield County. It is pointed out that since badly infested trees can not recover they should be cut between October 1 and May 1 and burned, as should dead branches and tops of living trees.

The pear midge (*Contarinia* [*Diplosis*] *pyrivorae*), which infested fruit at Cannon Station, Mystic, and Watertown, causing the young pears to drop freely, is briefly considered. The West Indian peach scale (*Aulacaspis pentagona*) was discovered in Greenwich, Conn., on Chinese privet (*Ligustrum ibota*), this being the first record of its occurrence in Connecticut, though collected on different species of *Prunus* at Jamaica Plain, Mass., 15 years previously.

A detailed report of mosquito work (pp. 242-249) in Connecticut in 1913 is followed by a brief discussion of the entomological features of the year, and miscellaneous insect notes. Under the latter heading mention is made of the dying oak trees, flight of spruce bud moth (*Tortrix fumiferana*), parsley stalk weevil (*Listronotus latiusculus*) taken in parsley brought from a vegetable farm in New Haven, the occurrence in Connecticut of the cottony maple scale, *Omphalocera dentosa* which was the source of more damage in 1913 than in any preceding year, the eggs of *Hemerocampa definita* and their resemblance to gipsy moth eggs, cocoons of the Prometheus moth (*Callosamia promethea*), the subsidence of the San José scale, galls which occurred on gooseberry, the cause of which has not been determined, abundance of spittle insects, pupa cells of the clover weevil (*Phytonomus punctatus*), the birch leaf skeletonizer (*Bucculatrix canadensisella*) which having subsided since 1910 is again apparent, the elm leaf beetle (*Galerucella luteola*), the poplar sawfly (*Trichocampus viminalis*) which for several years has been common on Carolina poplars in the vicinity of the station, the linden borer (*Saperda vestita*) which was rather common on young linden trees in one nursery, and the tarnished plant bug which was unusually abundant.

[Report of the] department of entomology, E. S. TUCKER (*Louisiana Stas. Rpt. 1912*, pp. 17-20).—A brief statement is given of the progress made in studies of the principal insect enemies of stored rice and their control.

Collections of rice at New Orleans, Donaldsville, and Crowley have shown as many as 16 species to be implicated in rice infestation. Among the more important of these are the rice weevil, which prefers milled rice, either whole or cracked but also occurs in unbulled grain; the lesser grain borer (*Rhizopertha dominica*), which is the source of the most damage to the rough grain; the Angoumois grain moth, which prefers the rough grain; the cadelle, which does not appear to injure the whole grain but lives in the ground products; and the rust-red flour beetle (*Tribolium navale*), which seems to depend upon crushed or powdered products in which to breed. The cadelle shows a tendency to prey on the more destructive pests and individuals will even devour one another.

Fumigation experiments with carbon bisulphid, hydrocyanic acid gas, and sulphur have shown that the penetration into bags of rice was insufficient to kill insects buried deeply in the grain. Heating rice to a temperature of 120° F. killed all insects but caused the grain to fracture and had to be abandoned. The placing of rice in cold storage through the warm months of the year was found to be an effective means of protecting rice from insects, but due to the expense only the choice grades have been kept in this manner.

In a 14 months' test of several grades of bagging it was found that rice kept in a bag made of fine drilling was slightly infested and damaged; in one made of 8-oz. duck scarcely an insect was found, or evidence of one among its con-

tents; while the grain kept in 10-oz. duck passed through the test in absolutely perfect condition. These tests were carried on surrounded by extreme infestation of grain.

Twenty-eighth report of the state entomologist, 1912, E. P. FELT (*Univ. State N. Y. Bul. 547 (1913), pp. 265, pls. 14, figs. 79*).—Field work with the codling moth was continued (E. S. R., 28, p. 156) and the results of the previous 3 years' work satisfactorily confirmed. Spraying during 1912 was confined to young and moderate-sized Ben Davis trees, a power spray being used. A check or unsprayed tree produced only 38.95 per cent of sound fruit, while sprayed trees yielded from 97.53 to 99.53 per cent of worm-free apples. Another plat similarly treated comprised larger trees and produced from 95.17 to 98.77 per cent of sound fruit. The results are presented in tabular form. In a commercial orchard at Arlington from 97.87 to 98.77 per cent of all the fruit sprayed was worm-free.

"Taking the check or unsprayed trees with their 98,952 apples or approximately 247½ bbls. as the standard, we find that one spraying in the first period reduces the number of wormy apples by 28,150 (70½ bbls.) or end wormy alone by 20,341 apples (50½ bbls.). The one late spraying 3 weeks after blossoming takes 15,854 apples (39½ bbls.) from the wormy column and but 12,546 apples (31½ bbls.) from the end wormy. The 2 sprays, one given just after blossoming and the second about 3 weeks later, reduced the number of wormy apples by 28,686 (72½ bbls.) and the end wormy by 20,441 (51 bbls.). This latter is not very different from the returns given by the first timely application, and in connection with the data for one late spray, shows at once that the latter is comparatively inefficient, so far as controlling codling moth is concerned. The 3 treatments, one spraying just after blossoming, a second about 3 weeks later, and a third the latter part of July, eliminate from the wormy column 30,081 apples (75 bbls.) and from the end wormy 20,458 apples (51 bbls.). . . . The second spraying resulted in a gain of only 1½ bbls., while 3 sprayings produced an additional gain over the 2 of but 2½ bbls., or a total gain over that secured from one application of 4½ bbls. The one late spraying eliminated only 39½ bbls. from the wormy column, a saving of approximately four-sevenths."

In a discussion of the Hessian fly the author reports upon losses in New York State in 1912, parasites, preventive and remedial measures, etc. An account of the fall army worm includes a bibliography of 43 references. In an article on the elm leaf beetle it is pointed out that it will feed upon poisoned foliage only when compelled by hunger and that as a consequence thorough spraying is necessary to secure satisfactory results. Summarized accounts of white grubs and June beetles (*Lachnosterna* spp.), the hickory bark borer (*Eccoptogaster quadrispinosa*), and the pear thrips, their life history, injuries, and control measures, follow.

Experimental investigations of the effect of insecticides on the hickory bark borer are said to give sufficient data to warrant a continuance of the work, particularly with a preparation of oil or carbolic acid for the purpose of destroying the beetles or the recently hatched grubs before they have had an opportunity to bore any distance from the egg chambers.

Studies of the life history of the queen blow fly (*Phormia regina*) show that from 12 to 24 hours are required for the incubation of the eggs, that the first larval stage lasts about 3 days and the second stage 2 to 3 days, while the period of active feeding in the third stage is limited to about 3 days, though the transformation to puparia may not occur until 3 days later. Observations on the Georgian flesh fly (*Sarcophaga georgina*) show that the second larval stage lasts about 4 days and the third stage 3 days, the prepupal condition persisting for about 6 days, the insects remaining in puparia 22 to 23 days.

The conclusions drawn in an article on the use of oils on dormant trees are similar to those in the article previously noted (E. S. R., 29, p. 354).

Under the heading of Notes for the Year the author gives brief accounts of some of the more injurious or interesting species coming to attention. The fruit tree insects include the fruit tree bark beetle (*E. rugulosa*), apple tent caterpillar, resplendent shield bearer (*Coptodisca splendoriferella*), apple leaf trumpet miner, Palmer worm, and pear midge (*Contarinia pyrivora*). The forest insects include the forest tent caterpillar, locust leaf miner (*Chalepus dorsalis*), bronze birch borer (*Agrilus anxius*), pine bark borer (*Ips pini*), and pine bark aphid (*Chermes pinicorticis*). Miscellaneous insects include the hawthorn sawfly (*Trichiosoma tibialis*), *Neuroterus saltatorius*, two-spotted lady beetle (*Adalia bipunctata*), two-spotted *Anomala* (*Anomala binotata*), mosquito control, cotton moth (*Alabama argillacea*), periodical cicada, Juniper bug (*Pentatoma juniperina*), and mite migration.

Lists are given of the publications of the entomologist and additions to collections.

In A Study of Gall Midges which is appended (pp. 127-226) the author gives a systematic descriptive account of the gall midges (Itonididæ or Cecidomyiidæ) of the subfamilies Lestremiinae and Heteropezinae, of which 11 of the former and 1 of the latter are described as new to science.

Report of committee on common names of economic insects in Hawaii, E. M. EHRHORN, D. T. FULLAWAY, and O. H. SWEZEY (*Proc. Hawaii. Ent. Soc.*, 2 (1913), No. 5, pp. 295-300).—This paper gives a list of the common names of some of the more important insect pests in Hawaii, including 17 species of Hymenoptera, 21 of Diptera, 29 of Lepidoptera, 25 of Coleoptera, 14 of Hemiptera, with the addition of 34 of Coccidæ, and 7 miscellaneous species.

Injurious insects in Brazil, G. BONDAR (*Bol. Agr. [Sao Paulo]*, 14. ser., No. 7 (1913), pp. 434-470, figs. 32).—This second paper (E. S. R., 30, p. 454) relates to the insect enemies of fruits belonging to the Myrtaceæ, of which 21 varieties are listed as being cultivated in Brazil.

Among the more important species dealt with are the cerambycid beetles *Polyrrhaphis grandini* and *Dorcacerus barbatus*; the buprestid *Conognatha magnifica*; a curculionid borer (*Cratosomus* sp.) a lepidopterous borer (*Stenoma albella*); a geometrid borer (*Siculades fulcata*); a hesperid (*Pyrrhopyge* sp.); several lepidopterous leaf feeders; and several hemipterans (*Pachycoris torridus*, *Capulina jaboticabae*, *C. crateraformans*, *Ceroplastes jancircensis*, and *Aleyrodes horridus*).

The principal insect enemies of grain in central and southern Russia, N. V. KURDJUMOV (*Trudy Poltav. Selsk. Khoz. Opytn. Stantsii*, No. 17 (1913), pp. 119, pls. 7, figs. 49).—This report upon the important grain pests of central and southern Russia is accompanied by excellent colored figures of most of the species dealt with.

Report of the zoologist, H. MORSTATT (*Pflanzer*, 10 (1914), No. 1, pp. 36-42).—A brief account of work with insect pests of cultivated plants in German East Africa is included in this report.

Fumigating nursery stock, G. C. BECKER (*Arkansas Sta. Circ.* 19 (1913), pp. 12, figs. 5).—The directions here given for the fumigation of nursery stock include plans for constructing a fumigating house and fumigating boxes.

White ants, W. W. FROGGATT (*Dept. Agr. N. S. Wales Farmers' Bul.* 60 (1913), pp. 46, pls. 4, figs. 9).—This account of termites deals with their general and Australasian distribution, structure of the nests, classification, injury, and preventive and control measures. A bibliography of papers dealing with the Australian white ants by 30 authors is appended.

Biology of the Thysanoptera, A. F. SHULL (*Amer. Nat.*, 48 (1914), No. 567, pp. 161-176).—This first part relates to the factors governing the local distribution of thrips.

Two new Thysanoptera from Porto Rico, J. D. HOOD (*Insecutor Inscitiæ Menstruus*, 1 (1913), No. 6, pp. 65-70, pl. 1).—*Heterothrips sericatus* from the flowers of guava (*Psidium guajava*) at Rio Piedras and *Podothrips semiflavus* from "para grass" (*Panicum barbinode*) at Guanica are described as new to science, the latter also representing a new genus.

On a collection of Thysanoptera from Porto Rico, J. D. HOOD (*Insecutor Inscitiæ Menstruus*, 1 (1913), No. 12, pp. 149-154, pl. 1).—Six species are here added to the known thysanopterous fauna of Porto Rico of which *Dinurothrips hookeri*, collected from *Ipomœa* sp. at Mayaguez, represents a new genus and species. It is pointed out that *Gynaikothrips uzeli*, a serious pest of the fig (*Ficus* spp.), appears to have been collected on tobacco in Porto Rico and may become of considerable economic importance.

Prosopothrips cognatus, a new North American thysanopteran, J. D. HOOD (*Canad. Ent.*, 46 (1914), No. 2, pp. 57-59, fig. 1).—*P. cognatus*, the species here described as new, was taken on wheat at Wellington, Kans.

The wheat louse (*Toxoptera graminum*), W. MOORE (*Agr. Jour. Union So. Africa*, 6 (1913), Nos. 3, pp. 482-492, figs. 12; 5, pp. 767-772; 6, pp. 973-977; 7 (1914), No. 1, pp. 50-60).—A general account of this pest, its occurrence in South Africa, natural enemies, and control measures.

A new American Phlebotomus, F. KNAB (*Insecutor Inscitiæ Menstruus*, 1 (1913), No. 11, pp. 135-137, fig. 1).—*P. atrocavatus* n. sp. is said to be of economic importance in Trinidad, where it occurs associated with man.

Preliminary characterization of the vector of verruga, *Phlebotomus verrucarum* n. sp., C. H. T. TOWNSEND (*Insecutor Inscitiæ Menstruus*, 1 (1913), No. 9, pp. 107-109, pl. 1).—The species here characterized for the first time has been found by the author to be the vector of verruga.

On the identity of verruga and Carrion's fever, C. H. T. TOWNSEND (*Science*, n. ser., 39 (1914), No. 994, pp. 99, 100).—This paper includes data relating to *Phlebotomus verrucarum* as an intermediate host of verruga infection.

Human case of verruga directly traceable to *Phlebotomus verrucarum*, C. H. T. TOWNSEND (*Ent. News*, 25 (1914), No. 1, p. 40).—The author reports upon the occurrence of this disease in his assistant in the verruga work, the cause of which he considers to be directly traceable to the bites of *P. verrucarum*.

Mosquitoes pollinating orchids, J. S. DEXTER (*Science*, n. ser., 37 (1913), No. 962, p. 867).—The author reports observations which indicate that the orchid *Habernaria obtusata* may be cross-fertilized by mosquitoes.

Further reports on flies as carriers of infection (*Rpts. Local Govt. Bd. [Gt. Brit.], Pub. Health and Med. Subjs.*, n. ser., No. 53 (1911), pp. 48, fig. 1).—Four papers are presented in this fourth report (*E. S. R.*, 25, p. 260), namely, An Experimental Investigation on the Range of Flight of Flies, by S. M. Copeman, F. M. Howlett, and G. Merriman (pp. 1-10); Memorandum on the Result of Examinations of Flies, etc., from Postwick Village and Refuse Deposit, with a Note on the Occurrence of the Lesser House Fly at Leeds, by E. E. Austen (pp. 11, 12); On the Part Played by Flies in the Dispersal of the Eggs of Parasitic Worms, by W. Nicoll (pp. 13-30); and Further Observations on the Ways in Which Artificially Infected Flies (*Musca domestica* and *Calliphora erythrocephala*) Carry and Distribute Pathogenic and Other Bacteria, by G. S. Graham-Smith (pp. 31-48).

The study of the rôle played by flies in the dispersal of the eggs of parasitic worms is summarized as follows: "Flies may convey eggs from excrement to

food and they may do so in two ways, namely, on the external surface of their body and in their intestine. The latter mode is practicable only in certain cases, where the eggs are of small size (under 0.05 mm. in diameter). On the external surface eggs of larger size (up to 0.09 mm. in the experiments) may be conveyed. Eggs adhering to the external surface are usually got rid of by the fly within a short time, but those which are taken into the intestine may remain there for two days or longer. The eggs which are conveyed in either of these ways may remain alive and subsequently cause infection. There are only certain parasitic worms in the dissemination of the eggs of which flies are likely to play an important part. This is determined in the individual cases by the nature of the parasite's life history and the resisting powers of its eggs. Material containing eggs of parasites and in particular ripe segments of tape-worms may remain a source of infection through flies for as long as two weeks.

"The eggs of the following parasitic worms have been shown experimentally to be capable of being carried by *M. domestica*: *Tania solium*, *T. serrata*, *T. marginata*, *Hymenolepis nana*, *Dipylidium caninum*, *Dibothriocephalus latus* (?), *Oxyuris vermicularis*, *Trichuris* (*Trichocephalus*) *trichiurus*, both internally and externally; *Necator americanus*, *Ankylostoma caninum*, *Sclerostomum equinum*, *Ascaris megalocephala*, *Torascaris limbata* (= *Ascaris canis* e. p.), *H. diminuta* externally only. No trematode parasites have as yet been experimented with.

The observations of Stiles that the larval fly can ingest ascarid eggs and pass them on to the adult fly lacks confirmation."

The peach tree borer (*Sanninoidea exitiosa*), E. N. CORY (*Maryland Sta. Bul.* 176 (1913), pp. 181-218, figs. 14).—This bulletin presents details of investigations of the life history of the peach tree borer and of control measures therefor based upon a period of 4 years' observations. In conducting the life history work 3 special cages inclosing 2-year-old nursery trees free from borers and eggs were made use of.

The greatest number of eggs deposited by a single moth was 161. Of all eggs deposited 390 were placed on the leaves and 65 on the trunk. The shortest period of incubation was 10 days, the longest 16½ days (in September), and the average 13 days. The earliest record of pupation was that of a larva collected May 31, 1910, which pupated on June 1. The pupal stage averaged 22 to 23 days in duration during the height of the season. "Of those that pupated June 1, 1910, the first male appeared on July 3, the first female July 7. Larvæ that pupated June 16, 1910, produced both males and females on July 11, 1910, a period of 25 days. In one case an infested tree trunk was brought into the laboratory in late fall, 1908, from which a male moth issued on December 9, 1909."

The natural enemies observed include *Telenomus quaintancei*, reared from eggs deposited on August 21, 1911; and *Bracon* sp. and *Macrodyctium* sp., reared from pupæ. An undetermined fungus parasite is said to increase largely the mortality of the pupæ.

The control measures have been summarized by the author under the headings of cultural treatments and mechanical barriers and repellents as follows: "Tobacco dust and earth mounds gave immunity for the first year, but on trial the second year failed to keep out the worms. Carbolic fertilizer and earth mounds gave poor results in one year's trial, so was not continued. Apterite and earth mounds did not give good results in that the material not only did not keep out the borers, but it also caused the formation of collar galls.

"Tanglefoot has never proved of value in any tests we have made and has always injured the bark to a considerable extent, the injury depending upon the age of the tree. Theoretically, it is an ideal barrier. Tanglefoot and

arsenate of lead is more injurious to the bark than tanglefoot alone. Gas tar has been highly recommended by various workers, but has never proved successful in our work and has injured the trees to some extent. We could not recommend its use on young trees. Pyroligneous acid, in addition to proving ineffective in keeping out borers, will very likely prove too expensive for large plantings. Rubberoid roofing paper, sheathing paper, and newspapers have not proved effective barriers, primarily because of the difficulty in making the union between the wrapping and the tree tight enough to prevent the entrance of the larvæ. Should the above purpose be effected the probable outcome would be that the larvæ would enter above the wrapping. The work of attaching protectors of any kind is a considerable item of expense. Wire protectors rust out quickly, are expensive, and do not protect. Wood veneer cracks and warps and a tight union is an impossibility; it is ineffective in keeping out borers. White lead and linseed oil has injured the bark on some of our trees and can not be depended on to prevent the entrance of the larvæ. White lead, linseed oil, and arsenate of lead is unsatisfactory, as it injures the bark to an appreciable extent. It does not prevent the entrance of borers. White lead, linseed oil, and lead chromate presents the same difficulties as the foregoing. All paint mixtures caused a blackening of the outer bark and gummosis, in addition to the fact that they were ineffective in keeping out borers. Concentrated lime-sulphur (commercial brand) has been highly recommended at various times, but in the author's experience with it on young trees it has not proved effective in keeping out the borers. The practice of spraying the crowns after the 'worming' to prevent fungus trouble is a good one." The addition of arsenate of lead to concentrated lime-sulphur apparently does not add to the effectiveness of the material. Atomic sulphur and arsenite of zinc and Hale's wash killed the trees on which they were applied and are strongly condemned. Quaintance wash, made from glue, builder's hair, and lime, was proved ineffective and undesirable from a laborer's standpoint. Arsenate of lead scaled off too quickly to be effective. Fish-oil soap rosin is not lasting enough nor is it effective for even a short period. Fish-oil soap and arsenate of lead besides being too easily washed off caused gummosis, probably due to the arsenical.

An annotated bibliography of 14 pages arranged chronologically is appended.

The sandwich caterpillar (*Agriophara rhombota*) (*Indian Tea Assoc., Sci. Dept. Quart. Jour.*, 1912, No. 1, pp. 2-5).—This caterpillar is said to occur commonly throughout the tea districts of northeastern India, occasionally becoming a serious pest.

The cabbage webworm, a pest of cabbage and allied plants, R. W. JACK (*Rhodesia Agr. Jour.*, 11 (1914), No. 3, pp. 416-422, pl. 1).—This Rhodesian pest is thought to be same as our imported cabbage webworm (*Hellula undalis*).

Leaf miners of the Hawaiian Islands, O. H. SWEZEY (*Proc. Hawaii. Ent. Soc.*, 2 (1913), No. 5, pp. 221-227).—Of the leaf miners here treated 21 belong to the Lepidoptera, 4 to Diptera, and 2 to Coleoptera.

The coconut beetles, *Oryctes rhinoceros* and *Rhynchophorus ferrugineus*, I. H. BURKILL (*Gard. Bul. Straits Settlements*, 1 (1913), No. 6, pp. 176-188).—This paper discusses the present status of these pests and control work in the Straits Settlements.

Bark beetles (Ipidæ) which injure useful tropical plants, M. HAGEDORN (*Tropenpflanzer*, 17 (1913), Nos. 1, pp. 43-51; 2, pp. 99-104; 3, pp. 154-160; 4, pp. 211-216; 5, pp. 266-270, figs. 19).—This paper deals with 42 bark beetle enemies of 19 different useful plants, including 1 species which attacks cotton, 7 species which attack coffee, 8 species which attack cacao, 11 species which attack various species of rubber trees, 2 species which attack sugar cane, etc.

Bee keeping for farmers, R. G. WARRY (*Dept. Agr. N. S. Wales Farmers' Bul.* 76 (1913), pp. 19, figs. 2).—A popular account.

Type species of the genera of ichneumon flies, H. L. VIERECK (*U. S. Nat. Mus. Bul.* 83 (1914), pp. 186).—This bulletin is the result of an attempt to put each ichneumonoid genus, of which there are more than 2,000 with some 25,000 species, upon a definite basis.

Descriptions of new Hymenoptera, VI, J. C. CRAWFORD (*Proc. U. S. Nat. Mus.*, 45 (1913), pp. 241-260, figs. 2).—Several of the species here described as new are of economic importance as parasites of insect pests. Among them mention should be made of *Ganaspis hookeri*, which was reared from the mango fruit fly at Mayaguez, P. R.; *Coccidoxenus portoricensis*, reared from the wax scale, at San Juan, P. R.; *Sympiesis metacomet* and *S. massussoit*, reared from swamp white oak leaves infested with *Lithocollctes hamadryella*, at Auburn-dale, Mass.; and *Anagrus giraulti*, reared from *Phthorimæa operculella*, at El Monte, Cal.

Descriptions of new Hymenoptera, VII, J. C. CRAWFORD (*Proc. U. S. Nat. Mus.*, 45 (1913), pp. 309-317, fig. 1).—Most of the species here described are of economic importance, among them *Polycystus foersteri*, *Derostenus agromyza*, *D. arizonensis*, *D. variipes*, *Entedon thomsoni*, *Pleurotropis utahensis*, and *Cirrospilus flavoviridis*, which are parasitic upon species of flies of the genus *Agromyza*.

A new species of mealy bug parasite (*Aphycus terryi*), D. T. FULLAWAY (*Proc. Hawaii. Ent. Soc.*, 2 (1913), No. 5, p. 281).—This parasite was reared from *Pseudococcus saccharifolia* at 2 localities on the island of Maui and at Hilo, Hawaii.

Parasites of the San José scale, H. T. FERNALD (*Ent. News*, 25 (1914), No. 1, p. 39).—It is stated that during the fall of 1913 from 75 to 85 per cent of the San José scale in orchards at Amherst, Mass., appeared to be parasitized by *Prospaltella perniciosi*, and that as large a percentage occurred on the small twigs as on the large ones. The evidence at hand is said to indicate that this species is the most active parasite of the San José scale in Pennsylvania. See also previous notes (*E. S. R.*, 29, p. 758).

Careful examination of twigs from Pennsylvania and Massachusetts indicates that in spite of the high percentage of parasitism it is hardly to be expected that the scale will become an unimportant pest while as high as 10 per cent of the scales are left to reproduce.

Pteromalids (Pteromalidæ) parasitic upon Hessian fly (*Mayetiola destructor*) with descriptions of two new species, N. V. KURDJUMOV (*Reprint from Ent. Vĕstnik [Kiev]*, 2 (1913), No. 1, pp. 4, figs. 5; *abs. in Rev. Appl. Ent.*, 2 (1914), Ser. A. No. 2, pp. 65, 66).—A description in English is given of *Eupteromalus arvensis* n. sp., a common parasite of *Mayetiola destructor* in Poltava, Moscow, and Kiev, and *Meraporus crassicornis* n. sp., reared from the Hessian fly's cocoon at Poltava and in Kiev.

Notes on Pteromalidæ (Hymenoptera, Chalcidoidea), N. KURDJUMOV (*Russ. Ent. Obozr.*, 13 (1913), No. 1, pp. 1-24, figs. 2).—This paper includes a synopsis of the genera of the subfamily Pteromalinæ.

FOODS—HUMAN NUTRITION.

Wheat investigations, E. F. LADD (*North Dakota Sta. Rpt.* 1912, pt. 3, pp. 295-347, figs. 11).—Brief statements are made regarding the wheat investigations carried on in the 5 years which have passed since the experimental mill was installed at the station. These are followed by a number of articles on wheat and milling by T. Sanderson and W. L. Stockham.

Durum wheat of the 1911 crop (pp. 298-305).—The results of milling and baking tests reported in this comparison of durum wheat of the crop of 1911 with the same variety grown in previous years and with hard red winter wheats of the crop of 1911 led to the conclusion that the 1911 durum wheat "was superior in practically all tests of quality to that of any of the preceding years since the beginning of our tests. Considering the products to be of equal value it would yield as large, if not larger, commercial returns to the miller and baker than any other type of hard wheat tested during the year."

It was also "superior to hard red spring wheat, grown upon the same farms, in grade, flour yield, texture, water absorption, and protein content. The hard red spring wheat excelled in color and baking strength.

"Durum wheat requires more care in baking than hard red spring, as it does not absorb the necessary water as readily. It has a shorter fermentation period. The durum bread is more yellow in color.

"The patent flour of durum wheat is superior to the hard red winter straight when considering 1911 samples. Winter wheat is decidedly lower in protein content and water absorption of flour than the durum."

The influence of the amount of rainfall on the yield and quality of wheat (pp. 305-324).—Data are given regarding the amount of rainfall together with the results of studies of the grade, chemical composition, and milling and baking qualities of wheat crops of 1911 in comparison with earlier years. The authors point out that wide variations in the rainfall in North Dakota are noted.

"The yield of wheat per acre is greatest in regions with a good rainfall and very low where the rainfall is slight. Wheat grown in the dry sections ranks higher in grade. Wheat grown in the dry sections produces a slightly higher percentage of flour. Wheat grown in wet regions yields flour of greater baking strength but varying more from sample to sample. Wheat from the dry region yields flour of slightly better color on the average. The lower grades of wheat, which are shrunken, rank high in protein content. Wheat from dry regions has a higher protein content than that of the same grade from a region of higher rainfall."

Strains of Fife and Bluestem wheats (pp. 324-328).—Data are brought together regarding a number of samples of Fife and Bluestem wheats grown in different years. The figures, according to the authors, do not indicate any important difference between these two sorts of wheat or between the strains, though, judging by the available figures, "it appears that Bluestem is somewhat more subject to variation in quality."

The relation of the amount of moisture in the soil at the time of maturity and the protein content of hard red spring wheat (pp. 329-331).—As a part of this study the moisture content of the soil was determined. A number of samples of wheat were compared and the range in water content was found to be from 4.60 to 33.22 per cent and in protein content from 9.14 to 18.72 per cent. From the data regarding moisture the conclusion was reached that "it takes considerable change in moisture content of the soil . . . to make much of a change in the protein content of the wheat."

Hard red spring wheats scoring low in color and texture (pp. 332-336).—The authors note that in milling the same wheat at different times variations in the color and texture score of the product were noted which were attributed to differences in climate, in tempering, and in milling. Scores for a number of samples low in color were brought together and compared to see whether more definite information could be gathered. According to their conclusion, the data presented were not sufficient to determine the effect of the various inseparable

impurities or the effect of any one kind of damage, such as frost or bin burning, but were sufficient to show that their combined influence was very marked.

Hard red spring wheat containing a high percentage of moisture (pp. 337-339).—To judge the effect of a high water content, samples of wheat containing above 13.5 per cent of water were compared with the general average of samples for the same years. "The effect of moisture on the weight per bushel is approximately the same for each of the 4 years and much as one would expect. Water is lighter than chaff wheat. It swells the wheat and thus reduces the test weight. The relation of the protein is not so definite. . . . The yield of flour from the wet wheats is approximately as much below the average for the various years as the moisture content is above, with the exception of the year 1911. . . . The wet samples lose more in milling than the average, which is in accord with results previously obtained. Most of the rejected wheats have fallen into this high moisture class, thus indicating the danger of storing wheats high in moisture. The color and texture of the high moisture wheat would rank above the average were it not for the presence of these rejected samples."

Moisture in the soil early in the spring and the dockage of hard red spring wheat (pp. 340-342).—The data brought together in the tables, according to the authors, do not confirm the popular opinion that wet springs, which mean vigorous growth of wheats, are responsible for high percentages of weed seeds in the wheat crop. However, "it may be that some of the samples were partially cleaned before arriving at the mill or that the nature of the preceding crop or time of plowing were more important factors in weed development."

Protein content of hard red spring and durum wheats from the same farm (p. 343).—The data reported for 5 samples of hard spring, durum, and winter wheats grown on adjacent fields in 5 counties showed an average protein content of 16.55, 17.48, and 15.28 per cent, respectively.

Variation in loss in milling (pp. 343-347).—Data are brought together regarding the loss in milling noted in wheats in the years 1908 to 1911, inclusive. According to the authors, "there is considerable variation in the loss in milling within the month and from month to month. The loss is greater in the winter time, on the average, than during the other months. This is significant, inasmuch as the precipitation is lightest at that portion of the year. Most mills are probably drier during the winter, because of artificial heat. The wheat in the elevator takes more moisture because of the humid condition during the winter and has more to lose."

Wheat study and investigation from a milling and baking standpoint, E. F. LADD (North Dakota Sta. Rpt. 1912, pt. 3, pp. 348-396, fig. 1).—The work of the station on the grading of wheat with reference to its bread making quality is reviewed, and tabular data showing milling and baking tests are reported and discussed.

According to the report, the data at hand do not cover a long enough period to permit the drawing of conclusions regarding all of the many factors given. A study of the more prominent tables shown "would indicate that the method now employed in the grading of wheat does not give proper value to the lower grades of wheat—that is, Nos. 2° and 3°—at least. The number of samples that we have had in the No. 4° and rejected grades were too small to allow . . . any very fair comparison to be made; but the comparison can be made down to No. 3° fairly well. The factors that stand out the clearest in favor of the lower grades are the percentage of flour obtained from them, the amount of water the flour will absorb, the volume and color of the loaf produced."

The data summarized also show that the method of grading is not satisfactory when compared with the prices paid for the wheat and those received for the mill products obtained from it.

A study of the effect of mean temperature during the growing season on the quality and grade of wheat, E. F. LADD (*North Dakota Sta. Rpt. 1912, pt. 3, pp. 404-431, figs. 4*).—Analyses and milling and baking tests are reported for wheats grown at mean temperatures ranging from a little below 60° to a little above 66° F.

The recorded tabular data show "that the mean temperature of the entire growing season is not an important factor; while there is no doubt that the temperature from day to day does have its effect. The mean temperature does not have any marked effect further than to show that the wheat produced with a mean temperature of above 60° and below 66° F. seems to produce a flour of a better baking quality than that produced below 60° and above 66°. The number of samples we have had to work with along this line have been limited; in many cases only having received one sample. In such cases it is not fair to draw definite conclusions."

Foreign types of wheat, crops of 1908-1910 and 1911, E. F. LADD (*North Dakota Sta. Rpt. 1912, pt. 3, pp. 396-403*).—The results are reported of milling and baking tests with a number of different types of foreign wheats. General deductions were not drawn.

Eighteenth report on food products, and sixth report on drug products, 1913, J. P. STREET (*Connecticut State Sta. Rpt. 1913, pt. 4, pp. 257-308*).—During the year 1913 the total number of samples examined was 1,902, of which 1,055 were not found adulterated, while 530 were adulterated or below standard and 68 compound.

Analytical and other data are reported regarding the character and composition of breads baked in Connecticut; candies, mostly of the cheaper sorts; "dehydro foods" (evaporated or concentrated vegetables and fruits), "prepared chiefly for travelers or campers who wish to carry food in a concentrated form"; diabetic foods; ice cream powders; jelly powders; canned pumpkin; some cereal breakfast foods; a pudding compound; powdered milk; coffee substitutes; "health biscuits," and cheese. Data are also given regarding the examination of dairy products and miscellaneous food samples, as well as the results of the examination of drug products and Babcock test glassware.

The cost of the samples of bread examined is discussed, among other matters. "The bread cost from 4.2 to 6.9 cts. per lb., with an average of 5.7 cts. The average cost per lb. in the 3-ct. loaf was 3.9 cts., in the 4-ct., 4.8 cts., in the 5-ct., 5.8 cts., in the 8-ct., 5.4 cts., and in the 10-ct., 5.8 cts. The cheapness of the 3- and 4-ct. loaves indicated, therefore, a real saving, as far as quantity is concerned, because the relative decrease in price was greater than the decrease in weight. The data for the 8-ct. loaves are limited to 3 samples, but these indicate that this sized loaf is a cheaper purchase than the 5-ct. loaf, about double the weight of bread being furnished for an increase in price of but 60 per cent."

From the actual weight of the samples of bread in comparison with the claimed weight, the author concludes that there is no special difficulty in maintaining the weight claimed.

In the case of the candies examined, "no foreign fat was found in any of the chocolate coatings, and no added mineral matter except in 1 sample of molasses kisses, which contained 3.78 per cent of ash.

"All but 2 of the 25 marshmallows contained gelatin. In many of these the adhering powder, consisting of powdered sugar and starch, was excessive, in 2 cases amounting to 2 oz. in the pound. . . .

"All but 2 of the 11 samples of licorice lozenges contained charcoal, in 1 case 0.23 per cent.

"None of the 4 samples of coated peanuts contained arsenic in the coatings."

Coal tar dyes were found in a number of the samples, some of them unpermitted colors.

Short weight was noted with 35 out of the 189 samples of candies examined.

Foods, drugs, and sanitation, E. F. LADD ET AL. (*North Dakota Sta. Rpt. 1912, pt. 2, pp. 288, figs. 2*).—This report covers work carried on up to November 1 in the calendar year 1912. Many pure food and drug topics and related matters are discussed, data presented regarding the examination of miscellaneous foodstuffs and drug products and regarding the sanitary inspection of groceries, restaurants, and so on, a number of formulas given for preserving fruits for display. Some experimental work is also reported.

It is pointed out that since the state law has been in operation marked improvement in conditions has been noted, approximately 95 per cent of the foods reported by the inspectors in 1912 being found to conform with the legal requirements. A similar improvement has been noted as a result of the sanitary inspection of places where foods are prepared, handled, stored, and disposed of.

The dangers from exposing foods to dust are discussed and the results of a test are given showing that grapes exposed in a basket upon the sidewalk in front of a store had 3,000,000 bacteria per grape on the outside of the cluster as compared with 780,000 on the inside. "The grapes from the outside of the cluster were found to contain colon bacilli, approximately, 5 per cc. of the washing water, or 100 colon bacilli per grape. The presence of intestinal bacilli gathered from the street dust shows the danger to which one is subjected when eating fruit of this kind, as is a common practice especially among younger children."

The results of a study of mince-meat and mince-pie filling are reported, and give information as to the composition and character of such goods. It is noted that at least a part of the manufacturers and dealers "are endeavoring to comply with the law, and are using a full 10 per cent of clean, wholesome meat in their different brands of mince-meat."

In connection with the examination of milk and other dairy products, the results of 8 analyses of human milk are presented.

The data gathered in a preliminary study of the effect of preservatives upon ciders seem to indicate that different apple juices act dissimilarly under the influence of sodium benzoate. "Doubtless an ultimate analysis of each experimental sample at stated intervals would assist in solving the problem."

A preliminary study was made of sorghum sirups, and ash analyses and other analytical data are reported. Definite conclusions can not be drawn, it is stated, until more work is done on the ash content. This factor appears to be rather constant in pure sorghum sirups. "This ash content of molasses and other sirups should be studied, as a clue to the grade and class of these products might be obtained . . . [from the composition of the ash]." It is stated that work of this character will be continued.

A report on rice, which is included, takes into account the facing of rice and summarizes data of other investigators as well as information regarding the protein and ash content of rice and its value and uses as food. Data regarding ash constituents and methods of detecting the facing of rice are given, and a study of rice oil was made, a number of samples being examined, particularly with reference to the detection of various oils "used sometimes to make rice appear a better quality; also to improve the appearance of good grades of rice and give them a finish."

An extended study of tomatoes, with special reference to canned tomatoes, is also included in the report, which summarizes data regarding the composition

of tomatoes as influenced by variety and other conditions, discusses the problems of tomato canning, and gives analyses of a large number of fresh tomatoes, canned tomatoes, and other tomato products, together with a bibliography of tomato literature.

In a study of the acid constituents of tomato juice "the acids of fresh tomato juice and canned tomato juice were found to be oxalic and citric, with perhaps a very small amount of malic acids. The greatest amount of the acid in tomatoes is due to oxalic acid."

[Food analyses and other pure food and drug topics], E. F. LADD and ALMA K. JOHNSON (*North Dakota Sta. Spec. Bul.*, 2 (1913), No. 20, pp. 341-350, figs. 3).—A number of pure food and drug topics are discussed, and information is given regarding the examination of miscellaneous foods, a proprietary remedy, and a number of samples of ferric chlorid.

A study of The Crease of the Wheat Kernel, by W. L. Stockham, which included data obtained with a number of samples, led to the conclusion "that the closed type of kernel produces a somewhat superior product on the average than does that with an open crease. Better results could probably be obtained if each sample had all its kernels of the type it represented. Because of present variation in type of crease, its relation to seed treatment, and milling quality, the crease offers as many if not more possibilities as a basis for selection than many factors now employed."

[Food analyses and other pure food and drug topics], E. F. LADD and ALMA K. JOHNSON (*North Dakota Sta. Spec. Bul.*, 2 (1913), No. 21, pp. 357-368).—Some data are given regarding the relative cost of a meal in hotels and restaurants of different grade and the relation of fancy marketing of food products to the cost of living. Pure food and drug topics are discussed and information given regarding the examination of miscellaneous foods, beverages, etc.

A sample of cloth said to have been purchased as "all wool" flannel was examined and found to contain approximately $\frac{2}{3}$ cotton and $\frac{1}{3}$ wool. "This is characteristic of a good share of the material sold as 'all wool' or 'commercial wool.'" The need for a textile law is urged.

[Food analyses and other pure food and drug topics], E. F. LADD and ALMA K. JOHNSON (*North Dakota Sta. Spec. Bul.*, 2 (1913), No. 22, pp. 373-392, figs. 2).—Miscellaneous food and drug topics are discussed and data reported regarding the examination of proprietary remedies, miscellaneous foods and beverages, and a number of samples of canned celery and tomato soups.

"The several constituents in these soups vary greatly, as for example, in the celery soups the percentage of sugar varies approximately from 0.08 to 1.37 per cent; while the total solids or extract for the same soups ranges from 3.08 to 8.49 per cent and in the tomato soups the range is even greater, or from 1.57 to 11.65 per cent."

It is stated that a number of samples of bottled carbonated beverages, "pops," have been submitted for examination, because either the bottle or its contents showed an insanitary condition. As yet experiments have not been made with such goods at the station, but the belief is expressed that manufacturers have sometimes been careless with respect to cleanliness and sanitary conditions, and attention is directed to the fact that illness may be conveyed by this means, particularly when the "pop" is drunk from the bottle, as is often done by children.

T. Sanderson reports a study of Milling and Baking Results of Marquis Versus Bluestem and Fife Wheats which takes into account the quality of the wheat as well as the results of milling and baking tests. Some variations were noted.

but, in general, milling results were in favor of the Bluestem and Fife wheats, while Marquis wheat had a slight advantage as shown by the baking tests. From the results obtained the author is of the opinion that there can be no harm in the continued production of Marquis wheat, and recommends that home-grown seed should be used as far as possible. "If this wheat will continue its present quality, there can be very little objection raised from a milling and baking standpoint to its production in large quantities."

A paper by W. L. Stockham is also reported, on Marquis Wheat—Protein Content, Strength, and Adaptability. As shown by the analyses reported, Marquis wheat flour had a lower protein content than spring wheat flour, while there was on an average little difference in the moisture content of the flour. As shown by baking tests, the bread made from Marquis wheat flour ranked in color a little lower than that from the other hard red wheats grown the same year, though the general average was good. From the data reported and discussed the author concludes that although "Marquis may be widely grown it will not maintain its standard in all sections of the State."

[Food analyses and other pure food and drug topics], E. F. LADD and ALMA K. JOHNSON (*North Dakota Sta. Spec. Bul.*, 3 (1914), No. 1, pp. 1-8, 12-32).—Baking powder frauds and other pure food and drugs topics are discussed and some information is given regarding some proprietary remedies.

A report is presented by T. Sanderson, entitled *A Study of the Variation in Weight of a Fifty-Pound Sack of Flour during Storage*. The flours used were blends of hard red winter wheats and hard red spring wheats, some of the latter samples graded down or "rejected" on account of having been sprouted or sprouted and bleached. The different flours, in 50-lb. sacks, were stored in the usual way from a little under 7 months to 11 months, weighings being made at intervals. Small gains and losses were noted with different flours, but, considering the 38 samples as a whole, there was an average gain of 0.2077 per cent in weight; or, leaving out of account 4 samples which were dried out, the average gain was 0.3257 per cent.

"The variation in weight is due largely to atmospheric conditions . . . during the spring and early summer moisture was lacking and ran below normal and during that period . . . the greatest losses in weight were experienced. Then during the latter part of June and July when the rains came all samples show material gains. . . . Temperature and condition of storeroom and atmospheric conditions should be considered when enforcing the food law. . . .

"Flour is more susceptible to variations in the summer months than in the winter.

"Wheat milled with a high moisture content is more liable to produce a flour that will lose in weight in storage than a wheat of low moisture content. . . .

"Moisture added in the tempering of wheat is, in this climate, very largely lost again in the storage of flour."

The baking quality of the flours was also taken account of. "The difference in the baking quality of the flour from both the hard red spring and the hard red winter wheat on standing, is very slight. In the case of the hard red spring, the color and texture show the only mentionable difference, while the hard red winter shows a slight gain in absorption, volume, and color."

With the other flours the difference in the average baking quality between the first and second baking was practically nothing, the individual samples varying a little in each case.

A study was also made of the gains or losses in weight during storage and the effect of storage on baking quality of hard red spring wheats blended with

from 3 to 15 per cent of barley and with from 3 to 15 per cent of rye, the bread being compared with bread made from barley and from rye alone. The samples containing from 3 to 15 per cent of barley all showed a loss, while those containing from 10 to 15 per cent barley and all samples containing rye showed widely varying gains in weight. No explanation of these variations is suggested, though the author does not believe that the barley or the rye had anything to do with it, as the amount of moisture added by these grains to the total originally present was very small. The baking test did not show "any material difference in either case, except in the color of the last baking of the rye blend which is noticeable owing to the low color score received by the 5 per cent rye mixture."

[Food analyses and other pure food and drug topics], E. F. LADD and ALMA K. JOHNSON (*North Dakota Sta. Spec. Bul.*, 3 (1914), No. 2, pp. 16, figs. 3).—Sugar vinegar is briefly discussed and other food and drug data presented.

In studies of wheat, which are reported, Velvet Chaff is compared with Fife and Bluestem. The different types of hard red spring wheats grown in North Dakota were considered from the milling and baking point of view, on the basis of data furnished by T. Sanderson, and the rank of Velvet Chaff among other spring wheat varieties in baking strength and protein content, in 1913, on the basis of material furnished by W. L. Stockham.

The conclusions drawn from the work were substantially as follows:

It has not been shown that the disparity in price between Minneapolis and Chicago markets for wheat is to be attributed to Velvet Chaff, but to the law of supply and demand.

Velvet Chaff appears in the past to have been used for mixing to raise the grade of other wheats and this to the disadvantage of the farmer. This wheat, lying between Fife and Bluestem in shape, is admirably adapted for mixing purposes, and in a mixture is hard to identify with any great degree of accuracy.

It would appear from the milling and baking records reported that some of the evils in flour attributed to Velvet Chaff, owing to seasonal conditions, are in reality chargeable to other standard varieties of wheat, namely, Fife and Bluestem. In general Velvet Chaff wheat of average quality ranks well with Bluestem one year with another, and in some seasons has averaged better than Bluestem. The authors are of the opinion that if all the Velvet Chaff wheat were to be uniformly blended with hard spring wheats, Fife and Bluestem, the quality of the bread could at the most be but slightly affected.

"Velvet Chaff has always stood above hard red winter wheat, considerable quantities of which are reported to be used in Minneapolis mills, especially when there is a shortage of hard red spring wheats.

"An examination of all the data shows that the variation in Fife and Bluestem wheats is just as great as that for Velvet Chaff wheat, and individual samples have been shown to be inferior to Velvet Chaff."

It has not been proved that Marquis wheat is well adapted to all parts of North Dakota, and there is evidence to indicate that for the drier part of the State it may not be well adapted.

"The effort being put forth to induce the farmers to take up the growing of Marquis wheat can only be justified when it is found that Marquis wheat does well in all parts of the State and produces a good milling and bread-producing flour."

Report of the work of the bakery laboratory, MOHS (*Ztschr. Gesam. Getreidew.*, 5 (1913), No. 9, pp. 258-261).—This report, which covers the first half of the current year, gives information regarding the samples of various

flours examined, the bread yield of different sorts of flour, malt preparations, a substitute for solid fat, yeast, dried milk preparations, equipment, and similar topics.

The composition of various milks and their adaptability for infant feeding, F. AGCAOILI (*Philippine Jour. Sci., Sect. A*, 8 (1913), No. 3, pp. 141-150, pt. 1).—A comparative analytical study of milks used for infant feeding in the Philippines, including human, carabao's, goat's, cow's milk, Australian cream, and various brands of sterilized, condensed, and dried milk. Directions for modifying milk are given.

The biological significance of phosphorus to the growing organism.—II, Analyses of organs with respect to the content of phosphorus and intracellular ferments, M. MASSLOW (*Biochem. Ztschr.*, 56 (1913), No. 3, pp. 174-194).—Continuing the report of previously described experiments with laboratory animals (dogs) fed on diets varying as to the amount and character of phosphorus provided (E. S. R., 30, p. 465), the author gives in detail the amounts of total inorganic and organic phosphorus and of phosphates found in the organs of the different animals and also the amounts and functional energy of catalase, lipase, amylase, and diastase in brain, liver, kidneys, heart, and lungs.

From the results he concludes that the addition of inorganic phosphorus to a diet lacking in organic phosphorus is of no service to the organism, which first draws upon its reserves of phosphorus and then shows a decline similar to that of phosphorus starvation. Inorganic phosphorus and glycerophosphates appear to be resorbed but not to be capable of taking part in the formation of complicated combinations in the body cells. Similarly the amount and functional energy of the intracellular ferments appear to be adversely affected by a lack of organic phosphorus in the diet.

Respiration and cell energy, H. A. WAGER (*Trans. Roy. Soc. So. Africa*, 2 (1912), pt. 5, pp. 405-418; *abs. in Bot. Centbl.*, 123 (1913), No. 4, p. 86).—Respiration, the author points out, "is not a function of any particular organ of a body but is a process going on in each individual cell. Thus, the lungs should not be called the organs of respiration—they are only accessory organs. The kidneys might just as well be considered as further organs of respiration in so far as they remove the decomposition products indirectly from the respiring cells, and the heart in so far as it pumps the respiring medium through the body."

From the digest of data presented, dealing chiefly with reference to vegetable life, the following conclusions were drawn:

"The energy required in the metabolism of colorless cells is not obtained from the sun either directly or indirectly. The protoplasm in colorless cells only uses energy set free by some chemical union taking place either in the cell or by the introduction of external elements into the cell. In no case is energy obtained by the decomposition of substances in the cell, as indeed energy is required to bring about such decomposition. Energy is not required for synthesis of compounds for which chemical affinity is responsible, although undoubtedly chemical affinity is inextricably connected with energy. No plant substance contains a store of directly available energy. Respiration is not a process apart from nutrition. The term respiration should be used exclusively to mean the interchange of gases taking place in each individual cell. . . . Water is the respiratory medium of a large number of the living cells in trees."

A formula for the determination of the surface area of infants, J. HOWLAND and R. T. DANA (*Amer. Jour. Diseases Children*, 6 (1913), No. 1, pp. 33-37; *abs. in Zentbl. Biochem. u. Biophys.*, 15 (1913), No. 12-13, p. 484).—A formula is given which is a modification of one used for adults.

ANIMAL PRODUCTION.

The domestication of animals, W. F. PYCRAFT (*Sci. Amer. Sup.*, 77 (1914), No. 1984, p. 21, figs. 2).—The author points out that the number of animals which man has succeeded in bringing into subjection does not exceed 26, and to make up this number animals like the elephant, llama, camel, yak, and reindeer must be included. Thus far attempts to domesticate the eland and zebra have proved unavailing, but it is now thought that by hybridizing these intractable creatures with domesticated animals some progress in domestication can be made. Examples of this are the crossing of the bison and the zebu with common cattle, the aim being greater size, stamina, and immunity to disease.

The production of such animals as the blue fox, skunk, mink, and sable for commercial purposes has come into common practice and marks a step in the utilization of these animals.

Isolation and selection allied in principle, J. T. GULICK (*Amer. Nat.*, 48 (1914), No. 565, pp. 63, 64).—In this article the author shows wherein isolation and selection are alike in transforming the hereditary characters of a species, and contends that "in the case of a variable and plastic organism, races more or less divergent will be produced, if for many generations the organism is divided into branches that are prevented from crossing."

Fermentation process in the digestion of ruminants and swine, J. MARKOFF (*Biochem. Ztschr.*, 57 (1913), No. 1-2, pp. 1-69, figs. 2).—A comparative study of the content of carbon dioxid, methan, hydrogen, organic acids, and other fermentation products of the stomach and intestines of cattle and swine under various feeding conditions. There is included a description of the apparatus used in collecting and determining the amount of these products.

Retention of maltase in the blood serum of hungry and fed animals, T. KUMAGAI (*Biochem. Ztschr.*, 57 (1913), No. 5-6, pp. 375-379, figs. 6).—The results of experiments with dogs indicated that the loss of maltase in the blood serum of hungry animals was greater than in that of fed animals. This bears out the results of former studies made on sheep, calves, and swine.

Ensilage and the production of milk and beef during the winter months, D. H. DE BURGH (*Dublin and London*, 1913, pp. 53, pls. 19).—In this booklet the author treats of the Irish method of ensiling grasses, hays, and fodder crops. Of especial interest is the description of methods of making sweet silage. It is stated that practically all the leading crops grown in the British Isles are suitable for making silage. The stronger grasses, such as cocksfoot, foxtail, timothy, dogstail, come out in fine condition, and wild vetch comes out well. Yellow shamrock clover comes out perfectly green while trefoil comes out brown, but sound. Most weeds, such as thistles and docks, come out well, while ribleaf always blackens.

The author emphasizes the importance of proper temperature in making silage. This temperature is set at about 122° F. and the silage crop is put into the silo only as this temperature is reached by the material already ensiled. To prevent overheating the material is watered after being placed in the silo.

Silo facts from Missouri farmers, J. K. WRIGHT (*Missouri Bd. Agr. Mo. Bul.*, 11 (1913), No. 9, pp. 108, figs. 12).—This is a bulletin in popular style, largely compiled from answers received in reply to inquiries submitted to about 1,000 farmers in the State. The subjects discussed include silage crops, cost of silage, filling the silo, preventing the spoiling of silage on top, the feeding of silage, supplements to use with silage, cost of harvesting and value of silage, and silo construction. Summarized accounts of station experiments in the feeding of silage to all classes of farm stock are also given.

The present state of the potato-drying industry in Germany, E. PAROW (*Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases*, 4 (1913), No. 9, pp. 1342-1345).—The total consumption of potatoes in Germany is estimated at 40,000,000 tons, of which 16,000,000 tons goes for cattle feed. Production is exceeding consumption with an attending waste, but potato drying is reducing the annual loss. The number of factories has increased $3\frac{1}{2}$ times in the past 5 years. One and one-half million tons of potatoes make 400,000 tons of the dried material. The technical development of potato drying has reached a high degree of perfection. In this article a number of standard processes are described.

Numerous feeding experiments have shown both slices and flakes to be sound concentrated feeds, relished by all classes of stock.

[Feeding stuff analyses] (*Fla. Quart. Bul. Agr. Dept.* 23 (1913), No. 3, pp. 210-219).—Analyses are reported of molasses feeds, wheat shorts, wheat midlings, cotton-seed meal, linseed meal, alfalfa and mixed feeds, and various proprietary feeds.

Stock feeds, J. W. INCE (*North Dakota Sta. Rpt.* 1912, pt. 3, pp. 432-434, 436).—Analyses are reported of cotton-seed meal, wheat screenings, prairie hay, pigeon grass, and various mixed and proprietary feeds.

Length of neck of lowland and highland cattle, G. LAUREE (*Deut. Landw. Tierzucht*, 17 (1913), No. 50, pp. 593, 594).—Measurements were made of the necks of various types of lowland and highland cattle, and the ratio between the length of neck and width of rump and height at the withers determined. It was found that the necks of the lowland cattle were the longer, but not so well muscled as those of the highland types.

Cattle raising in Chile, A. OPAZO (*Vie Agr. et Rurale*, 2 (1913), No. 50, pp. 641-644, figs. 3).—Statistics showing the status of animal production in Chile are given as follows: Horses and mules 746,105, beef cattle 2,674,666, sheep 4,528,109, goats 746,739, and hogs 338,993. It is stated that the opportunities for improved horse and cattle breeding in Chile are good. The climate is moderate, the crops variable, and the pastures luxurious. The principal European breeds of horses are in evidence, and there have been importations of the Durham, Holstein, Lincoln Red, and Normandy breeds of cattle, thus improving the native stock.

Improvement of the local cattle, V. P. SUBRAMANIA MUDALIAR (*Jour. Madras Agr. Students' Union*, 1 (1913), No. 2, pp. 97-109).—An account of the local breeds of cattle native to India, their breed characteristics, and utility value.

Discussion on rearing calves, R. S. SETON (*Dairy*, 25 (1913), No. 300, pp. 327, 328).—In this address available data are summarized as to the use of separated milk with fat substitutes for rearing calves. Experiments are cited showing the value of cod liver oil and fish oil as substitutes for milk fat, and attention directed to a practice in which whey is heated just below boiling and the coagulated albumin collected as "fleetings." This was fed after the second week in increasing quantity to the milk allowance until in the sixth week the calves were receiving 8 quarts per head per day. Thereafter the quantity was gradually displaced by hay, linseed cake, bran, and rubbed oats. Other rations are also suggested.

Comparative value of distillery-waste mixed feeds for sheep, W. VÖLTZ, W. DIETRICH, and A. DEUTSCHLAND (*Landw. Jahrb.*, 45 (1913), No. 1, pp. 1-27).—In these experiments 2 sheep were fed on alternate periods of 8 days each (6 days intervening between periods) on hay alone; hay and a distillery waste, turf meal, and charcoal prepared feed; and hay and a distillery waste,

chopped wheat straw, prepared feed. The average digestibility of the feeds as determined by these experiments is shown in the following table:

Digestibility of distillery-waste mixed feeds by sheep.

Kind of feed.	Organic matter.	Protein.	Ether extract.	Nitrogen-free extract.	Crude fiber.
	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
Hay alone.....	55.7	54.5	14.3	64.0	41.6
Hay and distillery waste, turf meal, and charcoal.....	50.4	68.2	13.2	57.0	29.1
Hay and distillery waste, wheat straw.....	65.0	74.8	41.3	69.1	51.8
Distillery waste, turf meal, charcoal.....	45.4	73.8	12.5	47.5	15.7
Distillery waste, wheat straw.....	73.2	83.8	63.7	74.5	60.6

The addition of turf meal and charcoal to the feed mixture apparently lowered its total digestibility, viz: Organic matter —5.9 per cent, protein —3.8, ether extract —0.4, nitrogen-free extract —9.9, and crude fiber +7.7. The use of turf meal as a filler in feed mixtures is thus condemned, while the advantages of the use of chopped wheat straw were made evident. Experiments by Pfeiffer are cited to show that while the value of chopped straw on the basis of its starch value in 100 kg. of dry matter is 2.01 marks, that of turf is —6 marks, or a difference of 8.01 marks. These results also correspond with those of Goy, in which it was found that the feeding of increasing amounts of sphagnum turf lowered the feeding value of its accompanying feeds.

The feeding of distillery waste materially increased the digestibility of the other materials in the mixture, thus making the apparent total digestible value of the distillery waste as follows: Organic matter 114.8 per cent, protein 91.2, ether extract 102.6, and crude fiber and nitrogen-free extract 148 per cent.

Feeding and care of breeding ewes, I. B. JOHNSON (*W. Va. Farm Bul.*, 1 (1913), No. 2, pp. 16, figs. 11).—This is a general discussion treating of the various breeds and their adaptability to West Virginia, selecting the farm flock, shelter and feeds for breeding sheep, management of the ewe and lamb, and sheep ailments.

Uncle Sam's Alaskan reindeer farm, H. M. TJERNAGEL (*Breeder's Gaz.*, 64 (1913), No. 25, pp. 1196, 1262, figs. 2).—During the period from 1892–1902, 1,280 reindeer were imported from Siberia, and in June, 1911, the statistics showed that there were 36,629 animals in Alaska distributed among 46 herds and belonging to 460 Eskimo owners. These reindeer are distributed among the natives by a system of apprenticeship, the native becoming absolute owner after an apprenticeship of 4 years.

The summer feeds consist of grass, weeds, foliage, and fresh shoots, and in winter of moss. The capacity for reindeer production in Alaska is said to be 10,000,000 head. The number of reindeer is increasing and the prospects for shipment of carcasses to the United States are good. The dressed weight of a 3-year-old steer is approximately 120 to 150 lbs. Reindeers are used as beasts of burden, the hide for clothing, and the does for milking purposes.

Meat production in swamps, P. B. POPEOE (*Jour. Heredity*, 5 (1914), No. 1, pp. 34–37, pl. 1, fig. 1).—In this article the adaptability of the Pigmy hippopotamus (*Hippopotamus liberiensis*) to southern swamp and marsh conditions is discussed. It is thought that these animals would readily adapt themselves to domestication and to the regions of the Temperate Zone. The weight of an adult male 10 years old is given as 420 lbs., that of a female 3 years old as 176 lbs.

Metabolism of matter and transformation of energy by fasting swine, F. TANGL (*Kisérlet. Közlem.*, 16 (1913), No. 4, pp. 482–507, figs. 4).—Experi-

ments were made with fasting swine to determine the minimum energy transformation for the maintenance of life.

According to these, in the case of lean growing swine, the transformation of energy was least at from 20 to 23° C., which is therefore the critical temperature. In the case of fattened animals the critical temperature may be about 17°. The transformation of energy determined at the critical temperature represents the minimum energy elimination of the swine, which according to the experiments averaged for fat swine 19.6 calories per kilogram, or 1,060 calories per square meter of body surface; for lean swine, 27.2 calories per kilogram or 1,100 calories per square meter. According to these figures the energy elimination per unit of body surface is independent of the fat content of the body.

On ovariectomy in sows, with observations on the mammary glands and internal genital organs, II, K. J. J. MACKENZIE and F. H. A. MARSHALL (*Jour. Agr. Sci. [England]*, 5 (1913), No. 4, pp. 418-423, pl. 1).—Continuing studies previously noted (E. S. R., 27, p. 875) it was found that black pigment is very frequently, but not invariably, present in the mammary tissue of Large Black, Berkshire, and other dark-colored sows. It is thought that by breeding from individuals in which this pigment is absent a strain may be built up of increased commercial value. It was further found that imperfect spaying, in which one, or a part of one, ovary is left behind, accounts for the frequent occurrence of spayed sows behaving as though they were "open."

Studies in comparative digestive physiology.—VI, On the course of drinking water in the stomach and the intestine of the horse, A. SCHEUNERT (*Pflüger's Arch. Physiol.*, 151 (1913), No. 7-10, pp. 396-406).—This is a continuation of studies previously reported (E. S. R., 28, p. 367). In this are given the percentages of water content in the forestomach, the fundus, and the pylorus portions of the stomach of the horse, when fed various quantities and proportions of hay, oats, and chopped straw. A study was also made of the course of and time required for the transport of water through the intestine.

[Studies on the normal intestinal flora of the horse], ANNA HOPFFE (*Ztschr. Infektionskrank. u. Hyg. Haustiere*, 14 (1913), Nos. 4-5, pp. 307-315; 6, pp. 383-404).—Studies are reported of the normal intestinal flora found in the forestomach, fundus, pylorus, cecum, duodenum, colon, ileum, and rectum of the horse at periods immediately after, $\frac{3}{4}$, $1\frac{1}{2}$, and 3 hours after feeding, together with the degree of acidity or alkalinity detected.

Did the horse exist in America before this continent was discovered by Europeans? E. TROUESSART (*Sci. Amer. Sup.*, 76 (1913), No. 1981, p. 387).—This article has been previously reported from the original source (E. S. R., 30, p. 174).

Biological searchlight on race horse breeding.—VI, The heredity of blood-vessel breaking in the Thoroughbred, J. B. ROBERTSON (*Bloodstock Breeders' Rev.*, 2 (1913), No. 4, pp. 265-281).—In this article (E. S. R., 29, p. 773) the author traces the early history of blood-vessel breaking, and presents evidence to show the heritability of this character. It is shown that while only one runner out of every 400 each year, on the average, breaks a blood vessel, the affected individuals have a close common bond and are readily referable to common sources. Herod, foaled in 1758, is given as the prime, if not the sole, source of blood-vessel breaking in the English Thoroughbred. This phenomenon behaves as a recessive character, being carried in a latent form by either sex. The author points out that while ordinarily "a true recessive character, such as chestnut coat-color, only becomes patent in the individual when a determining factor for it has been inherited from both parents . . . in certain charac-

ters which depend on structural or physiological peculiarities and which are marked departures from normality, one intense dose of the usually latent or abnormal character may be sufficient to overcome the normal condition, which has been inherited from the sound parent."

"If there is any tendency to sex limitations it is but very feebly manifested as compared with human hæmophilia."

Barcaldine, a horse who was never beaten (*Bloodstock Breeders' Rev.*, 2 (1913), No. 4, pp. 287-290).—An account of Barcaldine and his influence on the British Thoroughbred. He was the sire of 174 winners, represented by many of the prominent individual winners. It is stated that no fewer than 64 of Barcaldine's offspring won as 2-year-olds. In 9 seasons at the stud he sired 249 living foals, an average of over 27 per season.

Army remounts, M. F. DEBARNVILLE (*Jour. U. S. Cavalry Assoc.*, 24 (1914), No. 100, pp. 686-689).—The author argues for the infusion of Arabian blood into our saddle-bred and half-bred mares, with the hope of adding stamina and improving the army remount. It is pointed out that in France 120 pure-bred Arabian stallions and 275 Anglo-Arabs are stationed in the government "haras." In Germany the remount depots of Trakehnen and Beberbeck use a number of Arabian stallions, the aim at these studs being to breed for the cavalry a half-bred having 50 per cent of English Thoroughbred blood, 25 per cent of Arabian blood, and 25 per cent of native blood. Austria and Russia likewise are using Arabian stock in improving the cavalry horse.

The weight carrying capacity, endurance, and speed of the Arabian horse are pointed out, and it is thought that in spite of their small size, by careful selection of large well-bred native mares bred to Arabian stallions, a good sized product would be obtained.

Horse breeding in Japan, S. MAKOTO (*Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases*, 4 (1913), No. 9, pp. 1326-1332).—The total number of horses in Japan is given as 1,564,643, or 3.15 per 100 inhabitants. To improve the breed of Japanese horses 3 studs for horse breeding, one rearing farm for foals, and 15 stallion depots have been established. For providing the remounts to the army there are 10 remount depots and about 3,500 yearlings are annually purchased.

The breeds of horses native to Japan have few distinguishing features. The introduction of Arabs, Thoroughbreds, Anglo-Arabs, Hungarians, Anglo-Normans, and Hackneys is aiding in improving the native stock. Horse shows and exhibitions have recently been instituted.

[Application of an electric stimulus to animal life], T. T. BAKER (*Jour. Roy. Soc. Arts*, 62 (1913), No. 3186, pp. 70-78, figs. 2).—An experiment is reported in which the author claims that an "intensive chicken house, consisting of 6 flats, each large enough to accommodate 75 chickens, was electrified by a large helix of heavily insulated wire wound round it in turns about 6 in. apart. The current was applied for 10 minutes every hour during the day. Six chickens out of a total of 400 died, showing a mortality of only 1.5 per cent, and the chickens were ready for market despatch in 5 weeks as against 3 months.

In another instance the increase in weight of the chickens in the electrified house was said to be about 35 per cent. Again "one set of chickens was grown against another and the electrified chickens were only given two-thirds of the food given (per chicken) to the others. After one month the weight per bird was the same. . . . In either case the chickens showed signs of their second feathers much earlier than usual."

The origin and destiny of cholesterol in the animal organism.—XI, The cholesterol content of growing chickens under different diets, J. A. GARDNER

and P. E. LANDER (*Proc. Roy. Soc. [London], Ser. B*, 87 (1914), No. B 594, pp. 229-236).—This is a continuation of studies previously noted (E. S. R., 28, p. 462). Three diets were fed to different lots of day-old chicks, and analyses made at the end of 1, 2, 3, and 4 weeks for cholesterol content of the chicks.

With chicks fed on an ordinary diet "the total cholesterol decreases by about 15 per cent during the first week, and then increases again during the second week to within about 6 per cent of the value in the day-old chick. . . .

"In the case of animals fed on the extracted diet, there is a decrease in the total cholesterol during the 2 weeks, but the decrease during the first week is nearly double that in the second. . . . In the case of the animals fed on extracted food plus cholesterol, the total cholesterol increases during the two weeks, more markedly in the second than in the first. . . . The cholesterol content of the chickens thus appears to depend on the cholesterol content of the diets, but there is nothing in the figures of the first 2 weeks to indicate that in the growing animal the organism can synthesize cholesterol."

Fatty acids of hen's eggs, V. H. MOTTRAM (*Jour. Physiol.*, 47 (1913), No. 4-5, pp. XVIII, XIX).—In tests involving the analysis of over 50 eggs, the following observations were made:

"The mean iodine value of the fatty acids from eggs is fairly constant no matter what the locality and breed. This is true even if the eggs have been allowed to age somewhat. . . . Nevertheless, in any one breed and locality, there is considerable variation from the mean. . . . Hens, even from the same stock, fed on the same diet have individual peculiarities. One will deposit high iodine value fatty acids, another low. . . . There is a remarkable constancy in the iodine value of any one hen. . . . Infertile eggs of widely differing iodine values approximate in iodine values on incubation. . . . A similar observation has been made on incubated fertile eggs. As a whole incubation affects the iodine values but little. There is, however, evidence in the case of a hen laying low iodine value eggs of a rise in iodine value during the first week of incubation."

Egg records for the year 1912-13 (*Dept. Agr. and Tech. Instr. Ireland Jour.*, 14 (1913), No. 1, pp. 86-101).—Egg-laying records for 156 flocks including 4,859 birds are reported. The five highest breeds in laying capacity were: Minorcas, Rhode Island Reds, Brown Leghorns, Black Leghorns, and White Leghorns. The average number of eggs per flock laid for the year by all breeds was 112.5 per hen; the highest number laid 232.9, the lowest 50.1.

Chinese egg products, C. E. GAUSS (*Daily Cons. and Trade Rpts. [U. S.]*, 17 (1914), No. 3, pp. 46, 47).—It is reported that the United States takes about 10 per cent of China's egg products, both hen and duck eggs being used. The eggs are broken and the albumin separated from the yolk. The albumin is beaten, strained, and finally dried at a temperature of 130°. The egg yolk is well beaten, placed in cement tanks for 3 days, 2 per cent boric acid added, put in casks ready for export, and shipped in liquid form.

The British standard of perfection for Indian Runner ducks (1913, *Amer. Ed.*, pp. 8).—A description of the general breed characteristics and detailed points desired in the Indian Runner breed of ducks.

Carp breeding in rice fields in Italy, F. SUPINO (*Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases*, 4 (1913), No. 9, pp. 1332-1335).—Success is reported in Italian experiments in carp breeding in rice fields.

The fry are first raised in a spawning pond, and from 800 to 1,600 per acre put into the rice field according to conditions. When turned into the field the fry weigh 1 oz. per thousand; after 3 months fish weighing 3½ to 7 oz. can be found. The presence of carp in the field in no way hinders the usual cultivation

operations of the rice, and they are actually beneficial to the rice crop. During winter they are put into a pond or tank, 85 lbs. of fish to each 3-ft. cube, and the following summer again turned into the rice field, about 80 per acre. At harvest time each fish weighs 2 lbs. or more. If kept during a third summer they reach nearly 5 lbs. in weight. An acre of rice field may yield 90 lbs. of carp.

It is thought that carp may be used in the control of malaria since they feed on the eggs and larvæ of mosquitoes. The trout-perch was tried in rice fields and though it did not reach the same size as the carp, its flesh was of better quality.

DAIRY FARMING—DAIRYING.

Open stables versus closed stables for dairy animals, S. S. BUCKLEY (*Maryland Sta. Bul. 177 (1913), pp. 219-250, figs. 3*).—As the result of 3 seasons' observations made during the fall and winter months, the advantages claimed for open stables for dairy animals are the lower cost of construction, equipment, and labor. The cost of production of milk, based on the amount of food consumed, is also slightly less. The effects of extreme low temperatures are practically negative in reducing the flow of milk. The manure is better preserved owing to the thorough mixing of solids and liquids with the litter. The cleanliness of the cows and the bacterial content of the milk produced are more favorable. There are also the advantages of fresh air and light, a separate milking room, and less danger from slipping on floors. A greater percentage increase in body weight was obtained in the tests.

The maximum and minimum temperatures for each week during the winter months were taken for both open and closed stables, and while the differences were at times very great, no greater variation in the flow of milk was observed from the cows exposed to a temperature of -14° F. in the open stable than in those cows in the closed stable which were exposed to a temperature of $+14^{\circ}$. It is stated that there is no instance in which there has been a decided decrease in production of milk, temporary or permanent, which can be attributed to low temperature or to sudden fluctuation in temperature, unless at the same time there was exposure to rain.

The feeding and milking operations in the open stable are described as follows: "The cows occupy the open spaces of the stable during the time they are housed, and have access to the mangers for roughage, and to a plentiful supply of drinking water. The floor is abundantly supplied with bedding in the fall of the year, and as it becomes worked into the droppings, just enough new litter is supplied to keep the surface in good condition. After each removal of manure the floor is well supplied with fresh litter and the process of caring for it repeated.

"At milking time the cows are all driven into one end of the stable and the bars or gateway closed. Three cows are then allowed into the milking room (space for more than 3, in a stable of 30, is recommended) and fed grain. These are then milked and turned into the opposite end of the stable, directly from the milking room. A second set is then allowed in the milking room, fed, milked, and turned out. This is continued until all are fed, milked, and turned out. The bars or gates are then opened and the cows given the freedom of the stable until the next milking time."

A comparison between the bacterial content of milk drawn in the closed stable and in the milking room of the open stable, R. W. LAMSON (*Maryland Sta. Bul. 177 (1913), pp. 251-262*).—From the comparison reported it was found that while only general conclusions could be drawn there seemed to be quite an

advantage in favor of the open stable as a place to produce milk of a low germ content. The germ content of the air in the milking room of the open stable was less than in the closed stable, and fecal contamination of milk, as indicated by a fermentation of 25 per cent or more in a lactose-bile medium, was no greater than in the closed stable, where the cows require more careful attention. The individuality of the animal appeared to be an important consideration in producing milk of low bacterial content.

The sanitary significance of body cells in milk, R. S. BREED (*Jour. Infect. Diseases*, 14 (1914), No. 1, pp. 93-99).—The conclusions drawn from the studies made of the cellular content of milk are summarized by the author as follows:

"(1) Normal milk contains cells derived from the body of the cow which are of 2 entirely different types: (a) White blood corpuscles which are largely of the polynuclear and polymorphonuclear type; these cells make their way into the milk by passage through the epithelial lining of the secreting portion of the gland, possibly, also, through the epithelial lining of the ducts of the gland; (b) epithelial cells, nuclei, and cell débris discharged from the epithelial lining of the secreting portion of the gland and possibly also from the ducts.

"(2) The number of these cells in apparently normal milk is exceedingly variable even in the milk from the same cow. The variation in the number of cells in the milk from the different quadrants of the udder is almost as great as the variation in number of cells in the milk of different animals. Apparently the strippings always contain a greater number of cells than the milk from the earlier part of the milking.

"(3) It is very common to find milk that contains so few cells that they can scarcely be counted with the method of examination used, i. e., less than 5,000 per cubic centimeter, but milk containing one or more millions of these cells per cubic centimeter is met with frequently. The highest cell count which has been found in this work was in the case of the strippings from one-quarter of the udder of a cow 8 days after calving where the milk showed the enormous count of 54,300,000 cells per cubic centimeter. Nevertheless, this milk was of an entirely normal appearance and careful bacteriological examination of the udder showed no evidence of streptococcal infection. This milk had an entirely normal taste and caused no evil after-effects.

"(4) Out of 122 individual cows whose milk has been examined, 59 have been found to give cell counts under 500,000 per cubic centimeter, 36 gave counts between 500,000 and 1,000,000 per cubic centimeter, and 27 gave cell counts over 1,000,000 per cubic centimeter. The milk of all of these cows was normal in appearance and was sold or used by their owners, who had every reason to suppose that the milk was normal milk.

"(5) There are no satisfactory data at hand to show whether there is, or is not, a relation between high cell counts and any of the following: Streptococcal infection of the udder or other pathological conditions of the udder, colostral milk, milk from cows that are nearly dry, in heat, or in poor condition of flesh, etc. Such evidence as we have indicates that it is not at all likely that any of these conditions may be recognized by cell counts alone, especially in samples of market milk which consist of a mixture of the milk from several cows."

The author believes that while "it is entirely possible that some of the striking variations in numbers have a sanitary significance, as pathological conditions would certainly affect the discharge of these body cells . . . [it is] impossible to make even a guess as to the final conclusions regarding the significance of the variations in number and character of the cells."

Creamery bacteriology, O. JENSEN (*Die Bakteriologie in der Milchwirtschaft*, Jena, 1913, pp. 182, figs. 60).—Part 1 of this book treats of the micro-organisms

and the fermentation processes involved in creamery practice, of the types of bacteria, and of the fungi of yeasts and molds; part 2 deals with sanitation in the creamery, the normal and abnormal microflora of milk, the preservation of milk and method of handling for direct consumption, the processes of milk souring in the creamery, the normal and abnormal microflora of butter, the bacteriology of cheese making, and the judging of milk.

Modification of the composition of cow's milk by medicinal means, O. LANZONI (*Clin. Vet. [Milan] Rass. Pol. Sanit. e Ig.*, 36 (1913), Nos. 1, pp. 11-23; 2, pp. 58-69).—Experiments by the author indicate that the composition of milk may be materially modified by the effects of such drugs as sodium sulphate, magnesium sulphate, rhubarb, aloes, and arsenic. This alteration may consist in a loss of nutrients, due to a decrease in the total solids, or in an excess of casein, rendering the milk less digestible.

A study of the milk of Porto Rican cows, W. J. LUCAS, R. DEL VALLE SÁRRAGA, and J. R. BENITEZ (*Jour. Indus. and Engin. Chem.*, 6 (1914), No. 1, pp. 22-24).—This is a report of work giving the first of a series of analyses to be made for the purpose of determining a standard for Porto Rican milk.

The native Porto Rican cow gives only a small yield of milk, due to a deterioration of the strain, improper milking methods, and insufficient food. It was found that the milk may vary within wide limits as regards total solids and fat content and may run exceptionally high in solids-not-fat, ash, lactose, and refraction of copper serum. Guinea grass seems to be the best adapted as a pasture for cows, the fat content averaging considerably higher in the milk from cows so fed.

Seventh annual report of the B. C. Dairymen's Association (*Ann. Rpt. B. C. Dairymen's Assoc.*, 7 (1912), pp. 83, pls. 4, figs. 7).—Papers included in this report are as follows: The dairy sire, improving the dairy herd, business methods for the dairy farmer, dairy inspection, management of the dairy cow, community breeding, cow testing associations, and milk and its products in relation to public health.

Report of milk inspector, 1912, J. O. JORDAN (*Ann. Rpt. Health Dept. Boston*, 41 (1912-13), pp. 71-141, pls. 6, figs. 2).—This report relates to the consumption of milk in the city of Boston, the production of certified and inspected milk, sanitary precautions, bacteriological and sanitary inspection methods and results, investigation of milk contaminated with pus and streptococci, and examination of ice cream samples.

The municipal regulation of milk supply, E. O. JORDAN (*Jour. Amer. Med. Assoc.*, 61 (1913), No. 26, pp. 2286-2291).—In a study made of the municipal regulations of the milk supply of cities in the United States of over 25,000 population, it was found that the requirement of a permit or license is practically universal in all cities of over 50,000 inhabitants, while some of the cities in the 25,000 to 50,000 group require no permit and a considerable number have no ordinance regulating the sale of milk in any way. Dairy farm inspection of some sort is carried on by the great majority of cities, though the frequency of inspection is very irregular. Thirty-three per cent of the cities require that the tuberculin test be applied to herds furnishing milk. Bacterial standards for raw milk ranging from 100,000 to 1,000,000 have been established by the large majority of cities with over 100,000 population, while cities in the 25,000 to 50,000 group usually lack these requirements. About 30 per cent of the cities with over 100,000 population have half or more of their milk supply pasteurized. There is a general absence of any regulations dealing with the pasteurizing process.

It is shown that in the ten years 1902-1912 there has been an average increase in the retail price of milk in all parts of the United States of from 2 to 3 cts. a

quart; an extensive development in methods of supervision and an increase in the amount expended for supervision; and a noteworthy change in the growth of the process of pasteurization. The need of uniform and efficient milk ordinances and the proper adjustment of state and local control boards is discussed.

[Report of the dairy commission] (In *Nebr. Food, Drug, Dairy and Oil Com. Laws [Lincoln]*, 1913, pp. 12-16, 42-45, 69-71).—A text of the Nebraska laws and regulations pertaining to the sale of milk, imitation butter, and the sampling, weighing, and grading of milk samples.

[First, second, and final reports of the Irish Milk Commission, 1911] (*Irish Milk Com., First Rpt. (1911)*, pp. IV; App., pp. VII+405; *Second Rpt. (1911)*, pp. IV; App., pp. VI+363; *Final Rpt. (1911)*, pp. VI+61; App., pp. VII+220).—These reports with their appendixes relate to the alleged scarcity in the supply of milk in some parts of Ireland, the causes of the deficiency, where it exists, its effect upon the public health, the means whereby the deficiency may be remedied, the dangers of contamination and infection in the milk supply, and the methods best adapted to guard against these dangers. The establishment of milk depots and cow-testing associations and the provision of plants for the grazing in common of laborers' cows are recommended.

Proceedings of the Official Dairy Instructors' Association (*Proc. Off. Dairy Instrs. Assoc.*, 5-7 (1910-1912), pp. 146, figs. 5).—This gives the reports of the committees on dairy score card, experimental work in dairy manufactures and milk production, standards for dairy products, official methods of testing dairy products, judging dairy cattle, legal minimum of butter fat in butter, courses of dairy instruction, and lime and other alkali in the manufacture of butter.

Stilton cheese, MISS G. N. DAVIES (*Jour. Agr. [New Zeal.]*, 7 (1913), No. 5, pp. 502-510).—Methods for the manufacture of the high-priced variety of Stilton cheese are described. This cheese is known by its drab-colored, wrinkled skin, its mold throughout the cheese, and its flavor, which is partly due to the mold. Success in its manufacture depends largely upon the normal growth of the blue mold (*Penicillium glaucum*) within the cheese. Stilton cheese is not pressed, the whey being removed by gravitation and evaporation.

Ripening of sheep cheese, E. DE' CONNO (*Atti. R. Ist. Incoragg. Napoli*, 6. ser., 64 (1913), pp. 81-112).—This treats of the composition of sheep cheese and the chemical changes undergone in the process of ripening.

Wisconsin cheese factories, creameries, and condenseries by counties and dairy statistics, J. Q. EMERY (*Madison, Wis.: Dairy and Food Com.*, 1913, pp. 67, pls. 2, figs. 6).—A statistical review of the butter, cheese, and milk industry in the various States, and a list by counties of the cheese factories, creameries, skimming stations, and condenseries in Wisconsin.

VETERINARY MEDICINE.

[Animal diseases in the Anglo-Egyptian Sudan] (*Rpt. Wellcome Research Labs. Gordon Mem. Col. Khartum*, 4 (1911), *A. Med.*, pp. 41-56, 76-107, 343-361, pls. 6, figs. 15).—Several papers relating to diseases of animals are here presented. Animal trypanosomiasis in the Anglo-Egyptian Sudan (pp. 41-56) are dealt with by W. B. Fry and Spirochetosis of Sudanese Fowls (pp. 76-111) by A. Balfour. Under the heading of Veterinary Notes (pp. 343-352) A. Balfour presents observations regarding epizootic lymphangitis of equines, coccidiosis in cattle, piroplasmosis, anaplasmosis, and filariasis in the horse, camel, and hare. Acid-fast Bacilli in the Lung of a Camel (pp. 352, 353) and Interstitial

Pneumonia in a Camel's Lung (pp. 353, 354) are considered by R. G. Archibald; and Coccidiosis of the Intestine in the Goat (pp. 355-359) and A Few Notes on the Protozoa Parasitic in *Bufo regularis* in Khartum (pp. 359-361) are presented by A. C. Stevenson.

Is the specificity of the anaphylaxis reaction dependent on the chemical constitution of the proteins or on their biological relations?—II, The biological reactions of the vegetable proteins, H. G. WELLS and T. B. OSBORNE (*Jour. Infect. Diseases*, 12 (1913), No. 3, pp. 341-358).—In previous work (E. S. R., 25, p. 9) it was shown that zein, the alcoholic-soluble protein of corn, did not produce an anaphylaxis reaction in animals sensitized with gliadin or hordein. It was, however, found that gliadin from either wheat or rye interacted as if they were one and the same protein.

"Guinea pigs, sensitized with gliadin from wheat or rye, give strong anaphylactic reactions with hordein from barley, but these are not as strong as the reactions obtained with the homologous protein. Similar results are obtained if the sensitizing protein is hordein and the second injection is gliadin. We have here a common anaphylaxis reaction developed by two chemically distinct, but similar, proteins of different biological origin, thus indicating that the specificity of this reaction is determined by the chemical constitution of the protein rather than by its biological origin. This is in harmony with the fact that chemically closely related proteins have, as yet, been found only in tissues that are biologically nearly related.

"Complete protection to subsequent injection of the homologous protein was not afforded by a reaction to the heterologous protein, thus indicating the presence of two or more individual proteins in the preparations of gliadin and hordein, one of which is common to both, or else the presence in gliadin and hordein of both common and specific reactive groups. The chemical evidence is in favor of the latter conclusion. The foregoing indications are supported by saturation experiments, which show that when guinea pigs are sensitized with either gliadin or hordein, and then saturated with the heterologous protein, they still react strongly when injected with the homologous protein.

"Gliadin and glutenin react anaphylactically with one another, although chemical comparisons have shown them to be proteins of distinctly different types. Evidence was obtained that the reactions between these proteins should not be ascribed to contamination of the preparations with one another, i. e., to an incomplete separation of the two. The conclusion appears justified that these chemically distinct proteins contain common reactive groups. Guinea pigs sensitized with glutenin do not react anaphylactically with hordein, thus showing that the reaction between gliadin and glutenin is not caused by an incomplete separation of these latter proteins, but by reactive groups common to gliadin and glutenin, but absent from hordein.

"From the results of these experiments it seems probable that the entire protein molecule is not involved in the specific character of the anaphylaxis reaction, but this is developed by certain groups contained therein, and that one and the same protein molecule may contain two or more such groups. It may well be that the intact protein molecule is involved in the reaction (for there is but little evidence that anything less than an intact protein molecule is capable of producing the typical reaction), but that certain groups determine the specificity. Such a conclusion can not be accepted as final until we have some means whereby the chemical individuality of a protein can be established. Until then the possibility will remain that our so-called pure preparations of protein consist of mixtures, or combinations, of proteins which have thus far resisted all efforts to separate them. In this latter case the reactions

here attributed to groups in one protein molecule might be caused by individual proteins contained in the preparations made by the methods now in use.

"These experiments demonstrate that the 'group reactions,' characteristic of biological reactions between closely related species which usually have been interpreted as indicating the presence in related organisms of identical as well as distinct proteins, can really be exhibited by single isolated proteins from related organisms. In other words, biological relationship and chemical relationship seem to be much the same.

"Attention is also called to certain other observations: (a) That animals sensitized with two proteins will, as is well known, react with either, and that after recovery from reaction with one protein the reaction given with the second protein is less severe than it would be if the animal had not already passed through an anaphylactic intoxication; (b) that after injection with an intoxicating dose of a vegetable protein, another injection with the same protein 24 to 72 hours later, when the animal is usually insusceptible, so far as constitutional symptoms are concerned, often produces a severe, transient peritoneal irritation, which seems to be in the nature of a specific local reaction."

The milk-rennet inhibition test, K. PALLMANN (*Die Milch-Labhemmprobe. Inaug. Diss., Tierärztl. Hochsch. Stuttgart, 1912; abs. in Berlin. Tierärztl. Wehnschr., 29 (1913), No. 22, p. 405*).—Normal milks, milk from individual cows, and mixed milks show an inhibition or rennet action in dilutions from 1:1,000 to 1:1,500; most milks, however, coagulate at high dilutions. Variations between 1:1,000 and 1:4,000 occur. With colostrum the coagulating power is only strongly increased up to the third or fourth day post partum. After this period it returns to the point where the coagulating power resembles that of normal milk. On this account the test can not be relied upon as an indicator of a newly lactating animal. The milk from animals in the later stages of lactation almost always shows a diminished coagulating power.

A marked diminution or absolute loss in coagulating power is present in high-grade mastitis, especially in infectious mastitis; consequently the test can be used for detecting pathologic mammary secretions, particularly in conjunction with the milk (leucocyte) test. The factor which stands in the way of the use of the method for practical milk control is the difficulty of obtaining a standard rennet solution (*E. S. R., 29, p. 504*) and the cumbersomeness of the procedure.

The nature of the Kurloff body: A stage in the development of the eosinophil leucocyte, H. W. ACTON and R. KNOWLES (*Indian Jour. Med. Research, 1 (1914), No. 3, pp. 523-531, pl. 1*).—"The Kurloff body is found in the bone marrow of widely different animals, birds, amphibians, and mammals, and is not confined to the guinea pig. It can not, therefore, be a parasite. It is a phase in the development of the eosinophil cell and is identical with the structure known as an archoplasmic vesicle. The Kurloff bodies are, therefore, the bone marrow representatives of the granules of the eosinophil leucocytes, and their appearance in the peripheral blood of the guinea pig or other animal may be associated with helminthic infections. The Kurloff body is formed by the nucleolus in an exactly similar manner to other zymogen granules. We are, therefore, able to confirm Ehrlich's and Kurloff's view as to the nature of these bodies. They contain Secretin-Stoff. The eosinophil granules are derived from the nucleolus and are of the nature of zymogen granules. The phases in development seen in these archoplasmic vesicles from the Initial Körper to the formation of the spireme stage coincide exactly with the stages described by E. H. Ross^a in the development of the *Lymphocytozoon cobayæ*, and by Hartmann and Prowazek for Chlamydozoa."

^a Proc. Roy. Soc. [London], Ser. B, 85 (1912), No. B 576, pp. 67-72, pl. 1.

Cyanogenesis under digestive conditions, S. J. M. AULD (*Jour. Agr. Sci. [England]*, 5 (1913), No. 4, pp. 409-417; *abs. in Internat. Inst. Agr. [Rome]*, *Mo. Bul. Agr. Intel. and Plant Diseases*, 4 (1913), No. 12, pp. 1878-1880).—"Under digestive conditions cyanogenesis is likely to be inhibited by acids and alkalis, digestive juices, cellulose, glucose, and molasses, salt, and many other feeding stuff constituents and adjuncts. Owing to the time the food remains in the digestive tract before coming to the true stomach or the acid secreting portion of the stomach, normal inhibition is caused by the alkaline character of the salivary juices. This is likely to be the chief cause of the innocuous character of linseed cake.

"In the case of sheep fed with linseed cake shortly before being killed small amounts of hydrocyanic acid were to be found, chiefly in the rumen. Cyanogenetic feeding stuffs are most likely to be poisonous when fed with acid-containing or acid-producing foodstuffs, or where the hydrocyanic acid is preformed, as in the case of an improperly made linseed gruel. The small quantities of hydrocyanic acid normally produced from cyanogenetic feeding stuffs may possibly have a strongly beneficial action."

A bibliography of 15 titles is appended.

Investigations in regard to the relation of pseudoanthrax bacilli to anthrax bacilli with the precipitation method, W. PFEILER and L. DRESCHER (*Ztschr. Infektionskrank. u. Hyg. Haustiere*, 13 (1913), No. 7, pp. 391-401).—It has been shown by others that a specific reaction can be obtained with non-specific extracts prepared from material containing pseudoanthrax bacilli. With the object of determining what relationship exists between anthrax and pseudoanthrax bacilli from the serological standpoint, and especially with regard to the application of the results obtained to actual practice, experiments were made with anthrax bacilli, pseudoanthrax bacilli (*Bacillus anthracoides*), and a strain of *B. mesentericus*.

The reactions obtained with the extracts of pseudoanthrax strains and specific anthrax serum were in some cases weaker and in other cases stronger than those obtained with true anthrax extracts. Some of the pseudo extracts seemed to give a more marked reaction when used in a greater dilution than the anthrax extracts. The experiments seem to show that it is hard to distinguish between real anthrax organisms and pseudoanthrax.

The meiotagmin and epiphanin reactions in the diagnosis of carcinoma, W. H. BURMEISTER (*Jour. Infect. Diseases*, 12 (1913), No. 3, pp. 459-471, figs. 16).—"A decidedly negative meiotagmin reaction is of more value than a positive one and may be considered of some weight in ruling out carcinoma. A moderately or even strongly positive reaction is not necessarily indicative of malignant tumor.

"The epiphanin reaction is valueless in the diagnosis of malignant tumors. The range of error determined by the blind titrations in a measure also explains the results obtained by other workers who have employed this reaction in the diagnosis of diseases other than carcinoma."

A note on some experiments performed with a view to finding out the period before symptoms during which the saliva of an animal incubating rabies is infective, J. A. CRICKSHANK and R. E. WRIGHT (*Indian Jour. Med. Research*, 1 (1914), No. 3, pp. 532-535).—"It is difficult to infect rabbits and guinea pigs either intramuscularly or subdurally with the saliva of dogs or guinea pigs in the presymptomatic stage of rabies. In one case the saliva of a dog was infective 3 days before the animal showed symptoms. Even when the symptoms of rabies have manifested themselves it is still difficult to demonstrate the infectivity of saliva experimentally. This suggests that the bites of rabid dogs, even under optimum conditions for infection, may not infect

because the saliva is not virulent. Suspensions of the salivary glands themselves are much more certainly infective under experimental conditions than the saliva derived from them. This is more especially the case for the submaxillary gland. Negri bodies are not always demonstrable in the brains of experimental rabid animals, although they may become so after subpassage."

About the occurrence and the combating of rinderpest at the present time, P. KNUTH (*Ztschr. Infektionskrank. u. Hyg. Haustiere*, 13 (1913), Nos. 5, pp. 273-293; 6, pp. 356-369).—A review of the literature pertaining to this topic, accompanied by a bibliography embracing 51 titles.

Trypanosomes of game and domestic stock, A. KINGHORN and W. YORKE (*Ann. Trop. Med. and Par.*, 7 (1913), No. 2, pp. 227-238).—"Trypanosomes are of frequent occurrence in game and domestic stock in northeastern Rhodesia. As a conservative estimate the percentage of big game infected with trypanosomes pathogenic to man and domestic stock may at Nawalia (Luangwa Valley) be placed at 50, and at Ngoa (Kongo-Zambezi watershed) at 35. At Nawalia 6 species of trypanosomes were isolated from game and domestic stock, viz. *Trypanosoma rhodesiense*, *T. vivax*, *T. nanum*, *T. pectorum*, *T. montgomeryi*, and *T. multifforme*; whilst at Ngoa 5 species were found, viz. *T. rhodesiense*, *T. vivax*, *T. nanum*, *T. pectorum*, and *T. tragelaphi*."

"The results of examination of over 400 monkeys, wild rats, and mice were invariably negative."

Tubercle bacilli in the circulating blood of bovines artificially infected with pure cultures of the tubercle bacillus, W. BINDER (*Berlin. Tierärztl. Wchnschr.*, 29 (1913), No. 29, pp. 513-519).—The investigations here reported were made with 9 animals which had been treated with pure cultures of the bovine tubercle bacillus for some other experiments. For detecting tubercle bacilli in the circulating blood the Stäubli-Schnitter method and the Kurashige modification thereof were used, but the former method is preferred.

The author concludes that tubercle bacilli do occur in the circulating blood of tuberculous bovines, contrary to the findings of Schroeder and Cotton (*E. S. R.*, 22, p. 83), although in none of the cases were very many organisms found in a microscopic field. In the severest cases only 3 to 5 organisms per field were noted. When intravenously injected the bacilli were noted in the blood from 3 to 11 days later, then they disappeared and reappeared after 17 to 30 days. While it was easier to detect the tubercle bacilli in severe cases, no prognostic significance, the author says, can be attached to the finding of tubercle bacilli in the circulating blood.

Tubercle bacilli in the circulating blood, E. ROSENBERG (*München. Med. Wchnschr.*, 60 (1913), No. 8, pp. 404, 405; *abs. in Deut. Med. Wchnschr.*, 39 (1913), No. 11, pp. 522, 523).—In the blood of nearly all cases of tuberculosis (pulmonary and surgical cases in man) acid-fast bacilli resembling the tubercle bacillus were noted. They were never found in the blood of normal subjects.

The detection of tubercle bacilli in the circulating blood, E. KAHN (*München. Med. Wchnschr.*, 60 (1913), No. 7, pp. 345, 346; *abs. in Berlin. Tierärztl. Wchnschr.*, 29 (1913), No. 22, p. 402).—Attention is called to the fact that a mere microscopical examination of the blood is not an adequate means for detecting the presence of tubercle bacilli in the circulating blood. The animal test is the most certain method.

Chemotherapy of tuberculosis with gold preparations, A. FELDT (*Deut. Med. Wchnschr.*, 39 (1913), No. 12, pp. 549-551; *abs. in Berlin. Tierärztl. Wchnschr.*, 29 (1913), No. 22, p. 402).—The preparations used were combinations of cantharidin and gold, and for their preparation cantharidinethylen diamine, which is a nontoxic preparation, and gold cyanide were employed. Cantharidin, which is capable of producing a reaction in tuberculosis and in other inflammatory

areas, while toxic has no germicidal properties. All the preparations produced a marked local reaction (secondary tuberculin reaction), but when given intravenously to rabbits yielded favorable results. The life of these animals was not only prolonged for many months but, in addition, an increase in weight was produced. No improvement was noted in guinea pigs which received the preparations subcutaneously.

The treatment of bovine mammitis by serum, B. EGGINK, JR. (*Tijdschr. Veeartsenijk.*, 39 (1912), No. 5, pp. 194-197; *abs. in Ann. Méd. Vét.*, 61 (1912), No. 6, pp. 332-334; *Vet. Rec.*, 25 (1912), No. 1253, p. 18).—The use of an anti-streptococcic serum as a treatment for acute and fairly well advanced, non-purulent cases of mammitis gave good results.

[Cattle ticks in Costa Rica], J. E. VAN DER LAAT (*Bol. Fomento [Costa Rica]*, 3 (1913), No. 4, pp. 259-263, figs. 2; *abs. in Rev. Appl. Ent.*, 1 (1913), Ser. B, No. 9, p. 159).—The author describes the method employed in dipping ticky cattle in Costa Rica, where the practice is said to be well established on a large number of large estates.

The tick problem in New South Wales, M. HENRY (*Agr. Gaz. N. S. Wales*, 24 (1913), No. 10, pp. 829-837).—A general discussion of the situation in New South Wales.

Abortion in sheep, J. MCFADYEAN ET AL. (*Rpt. Dept. Com. Bd. Agr. and Fisheries [Gt. Brit.], Epizootic Abortion, 1913, pt. 3, pp. 12; App., pp. 33, pl. 1; abs. in Vet. Rec.*, 26 (1913), No. 1329, p. 401).—This is the third and final report of the committee appointed to inquire into epizootic abortion (*E. S. R.*, 24, p. 388). An appendix to the report, by J. McFadyean and S. Stockman, issued as a separate publication, contains a detailed account of the experiments and observations upon which the report is based. This report, which forms the first account of a hitherto unrecognized disease, summarizes all that is known regarding it.

Though *Bacillus abortus* is known to be capable of producing abortion in sheep it is not the common cause of the ovine disease in Great Britain. The only specific form of ovine abortion which the committee met with is due to a vibronic organism. Descriptions are given of the morphological and cultural characteristics of this organism which resembles the spirochete in appearance though not in its cultural requirements. Experimentally this vibrio may cause abortion in cows as well as in sheep and two naturally occurring outbreaks of vibronic abortion in cows were met with, one in Ireland and one in Wales.

The alimentary tract appears to be the most common natural channel of infection. Usually, for some time before abortion takes place, there is an infective discharge from the vulva. The disease is enzootic rather than epizootic in character, not spreading rapidly from farm to farm. "The symptoms are not very distinctive—perhaps a sanious, mucoid vulvar discharge before abortion is the most significant one. Usually abortion takes place at an advanced period of pregnancy. Very often the fetus has died at a much earlier stage, though lambs may be born alive from an infected uterus at or about full time. Often both fetus and membranes are putrid when expelled, and metritis, which may be fatal, is not a rare complication. At post-mortem, in the later stages, the uterus shows edema and congestion, with an abundant exudate between chorion and uterus. All the uterine contents—exudate, membranes, and fetus—contain the vibrio, and are virulent.

"The spread of the disease under natural conditions requires further investigation; but it is certain that an ewe may discharge vibrios from the vagina, and thus be infective, long before showing any signs of impending abortion. It is doubtful whether the ram has much or any importance as a factor in contagion. There is also much still to be learned as to how long the

vibrio can live outside the body. It seems to soon lose its pathogenicity when cultivated; and serious outbreaks of the disease do not usually occur on the same farm year after year. But nevertheless there is some evidence that the microbe may exist, saprophytically or otherwise, outside the body of the sheep. The symptoms, circumstances, post-mortem lesions, and microscopical findings are all of importance in diagnosis. The agglutination test promises to be of practical value here, and the complement fixation test is also being worked upon."

The committee advance various recommendations for prevention, including destruction of virulent material, isolation of aborting ewes and disinfection of their genitals, and the avoidance of penning ewes together in close proximity before lambing. Thus far the committee do not consider legislative measures applicable to the disease.

A new (?) strongyle causing parasitic gastritis in a goat, J. B. BUXTON (*Vet. Jour.*, 70 (1914), No. 464, pp. 89-94, figs. 5).—The nematode here considered closely resembles the strongyle of Axe, which is found in the stomach of the horse but apparently causes no ill effects, and the *Strongylus gracilis* of cattle and sheep, from which, however, it differs in several respects.

The detection of erysipelas in hogs with the precipitation method, L. DRESCHER (*Mitt. Kaiser Wilhelms Inst. Landw. Bromberg*, 5 (1913), No. 4, pp. 322-331; *abs. in Berlin. Tierärztl. Wchnschr.*, 29 (1913), No. 27, pp. 489, 490).—As a result of the experiments conducted, the conclusion is reached that Ascoli's thermoprecipitation reaction when used for diagnosing erysipelas in hogs is without value for practical purposes.

About the detection of antibodies in the blood of horses immunized with voldagsen (hog cholera) bacilli and hogs affected with voldagsen cholera, W. BUCHAL (*Mitt. Kaiser Wilhelms Inst. Landw. Bromberg*, 5 (1913), No. 4, pp. 263-276; *abs. in Berlin. Tierärztl. Wchnschr.*, 29 (1913), No. 27, p. 490).—After pointing out that bacteria present must also be considered when studying hog cholera, the results of experiments made with the complement fixation, agglutination, and precipitation tests are reported.

In conjunction with the tests some experiments were made with reference to the valuation of immune sera produced in two horses which were previously treated with voldagsen strains of bacteria. It was noted that the sera of both horses contained agglutinins, precipitins, and complement fixing substances, and one of the horses showed a much greater antibody formation than the other. No bacteriolysins were produced. The protective value of the sera for mice was 0.1 cc. and upwards.

The sera of the hogs which had passed through a voldagsen or other infection did not show the same constancy in regard to agglutinating, precipitating, or complement fixing substances as the horse sera. Incidentally it was found that the sera of sound hogs contained a normal precipitin for the voldagsen precipitinogen. This normal precipitin was noted in horse serum also.

A case of the septicemic form of hog cholera in German Southwest Africa, SCHMID (*Ztschr. Infektionskrank. u. Hyg. Haustiere*, 13 (1913), No. 6, pp. 353-355).—A description of the case with a statement of the findings on autopsy.

Trichinosis, J. M. VAN COTT and W. LINTZ (*Jour. Amer. Med. Assoc.*, 62 (1914), No. 9, pp. 680-684, figs. 2).—The authors report that they have demonstrated for the first time the presence of living trichinae in the cerebro-spinal fluid in vivo. Salvarsan as shown in cases treated is useless as a therapeutic agent.

Cerebro-spinal meningitis ("forage poisoning"), J. R. MOHLER (*U. S. Dept. Agr. Bul.* 65 (1914), pp. 14).—The data here presented have been previously noted from another source (*E. S. R.*, 28, p. 886.)

[Mal de caderas in British Guiana] (*Agr. News [Barbados]*, 12 (1913), Nos. 500, p. 345; 304, p. 411).—This note relates to the occurrence of a disease in

British Guiana, which is in all probability mal de caderas. This disease, provisionally described in the report of the government veterinarian as cerebrospinal meningitis, has been prevalent among mules and horses in certain districts of Berbice, British Guiana.

Tests in regard to the diagnostic value of the ophthalmic reaction in glanders, LORENZ (*Berlin. Tierärztl. Wchnschr.*, 29 (1913), No. 14, pp. 252-255).—A report in regard to tests made according to the specifications suggested by Fröhner, namely, 0.05 gm. mallein siccum (Foth) dissolved in 4.5 gm. of a 0.5 per cent carbolic acid solution. The solution was prepared on the day it was to be used. Several drops were instilled in the conjunctival sac of the right eye, and in the left eye a few drops of a 0.5 per cent carbolic acid solution were introduced. This procedure was found to be especially valuable for restless animals.

The agglutination and complement fixation tests were made in addition to the above but were always conducted before the conjunctival reaction. Autopsies made of the 13 animals agreed with the findings of the mallein test in all cases, while the agglutination and complement fixation tests were negative in two cases where the animals were positively glandered. The conjunctival test is deemed a good one providing it is carefully conducted and the results obtained properly interpreted.

Observations in regard to the influence of mallein on the results of other diagnostic methods with sound horses, R. REINHARDT (*Ztschr. Infektionskrankh. u. Hyg. Haustiere*, 13 (1913), No. 6, pp. 295-306).—For this work mallein siccum (Foth) was used in the ratio of 0.03:5 cc. in 0.5 per cent carbolic acid solution. The solution was used for both the conjunctival and cutaneous tests, although for the latter mallein brute (Pasteur Institute) and concentrated mallein (Klimmer) were also employed. In addition to the above tests the precipitation, complement fixation, and agglutination tests were compared.

A cutaneous or conjunctival instillation of mallein did not have any influence upon the outcome of a thermomallein reaction nor upon the serologic blood tests. Evidently the amount of antigen taken up by the blood stream as a result of cutaneous or conjunctival introduction is too small to produce appreciable amounts of antibodies. By giving mallein once or twice subcutaneously no effect on a subsequent cutaneous or conjunctival test with mallein was produced.

As a result of giving mallein subcutaneously, in most instances a negative precipitation reaction was obtained, and only in one instance where Foth's mallein was used was a positive reaction noted. In a few instances the complement fixation reaction was positive after mallein was introduced either once or twice subcutaneously. In these cases one horse showed positive 29 days after receiving the antigen for the first time, and 2 other animals after 13 (negative for 151 days), 19, 29, and 42 days (negative 157 days), respectively, after a second injection.

According to the tests complement-fixing bodies may be in the blood of sound horses after 3 days and on an average in from 4 to 9 days. The bodies which result from giving a second injection seem to remain longer than those produced by a single injection. The agglutination value was found to be raised in every instance when mallein was injected. The agglutinins required about 3 days or a little over for their production and the highest value was noted in a horse 8 days after malleinization. The highest average values were obtained between the eighth and nineteenth days. A second injection in some cases increased this value. When a complement fixation test was obtained the agglutination titer was usually high, but in some cases where the agglutination test was high no inhibition of hemolysis was noted.

The transmission of swamp fever in horses, L. D. SWINGLE (*Wyoming Sta. Rpt. 1913, pp. 93-123, figs. 26*).—The author's feeding experiments with urine and blood of infected animals show that it is not an easy matter to infect the horse through the digestive tract, but do not prove that it is impossible to do so. It is pointed out, however, that the amounts of blood and urine used in the experiments and those used by other investigators who claim to have secured infection by such methods are very large as compared with the amount that a horse could possibly obtain under natural conditions. "Therefore, we may conclude that ingestion of blood or urine is not the natural mode of transmission of the disease and especially would fail to explain epidemics."

Healthy horses which associated with sick ones for about 2 years, running together in the same yard, feeding from the same mangers, and drinking from the same trough, no precaution being taken against transmission, did not contract the disease. In addition these animals drank water and ate grain and hay contaminated with urine and blood from various infected horses, but not a single case of infection resulted, except when directly inoculated hypodermically or intravenously with virulent blood.

In studies made of the blood of all the horses afterwards used in the experiments bodies corresponding to the description and figures presented by Mack in the account previously noted (*E. S. R., 27, p. 684*) were found, and in some cases stained with Giemsa's stain rings similar to those described by Mack were detected. The author states that it is almost certain, however, that the rings in his slides are artifacts, there being all gradations between the small rings, which are doubtful when considered by themselves, and large rings that are unquestionably artifacts. These structures are said to have been found both within or on the corpuscles and in the plasma. The author considers it possible that these bodies are a nonpathogenic *Anaplasma* such as is sometimes found in healthy rats, goats, calves, pigs, and marsupials.

The influence of compensated salt mixtures on the development of polyneuritis gallinarum and beri-beri, R. B. GIBSON (*Philippine Jour. Sci., Sect. B, 8 (1913), No. 5, pp. 351-367, pls. 4*).—"The addition of a compensated salt mixture to white rice fed to fowls has not prevented the development of polyneuritis gallinarum. However, the onset of the disease seems to have been slightly protracted, and the degenerative changes in the nerves were less pronounced."

Reliable poultry remedies (*Quincy, Ill., 1913, pp. 95*).—This is a compilation from the writings of several authors, including P. T. Wood and N. W. Sanborn.

RURAL ENGINEERING.

Increasing the duty of water, B. A. ETCHEVERRY (*California Sta. Circ. 114 (1914), pp. 8*).—This circular summarizes available data, and points out that for an average irrigation system the conveyance losses may be fully 30 per cent of the water diverted, while of the amount delivered 25 per cent or more may be lost by deep percolation, 25 per cent by soil evaporation, and 10 per cent by surface run-off; the total of these losses being 76 per cent of the water diverted.

"By adopting means of conservation which have been used successfully in irrigated districts where water is valuable the waste and loss may be so decreased that the water supply will serve two or three times the area served with the irrigation methods now prevailing in many sections." "Where the value of the water will justify it, concrete linings will decrease the conveyance loss to about 5 per cent of the water diverted; the deep percolation loss, where water is used with care, could be very nearly entirely prevented, and would

probably not exceed 10 per cent of the water applied; the evaporation loss, where the crops will permit deep furrow irrigation and cultivation, will probably not exceed 15 per cent of the water applied; the surface run-off loss or waste can be eliminated. The total losses for these conditions will be about 27 per cent."

Flood flows, W. E. FULLER (*Proc. Amer. Soc. Civ. Engin.*, 39 (1913), No. 5, pp. 1011-1064, pls. 5, figs. 6).—The object of this paper is (1) to present a study of the frequency of floods, (2) to show the relation between the catchment area and the magnitude of the flood, and (3) to present formulas and tables to serve as an aid to judgment in estimating the probable maximum flood to be expected on a river.

It is concluded from this study that although flood flows on different rivers vary greatly some of the characteristics of the rivers affect the floods in substantially the same manner throughout the country. The effect of the size of the catchment area on the flood flows throughout the country is much the same and this relation may be represented approximately by the expression, $Q (Ave.) = C A^{0.8}$ in which $Q (Ave.)$ equals the average yearly flood in cubic feet per second, C equals a coefficient which is constant for the river at the point of observation, and A equals the catchment area of the river in square miles. The relation between the maximum rate of flood flow on a stream in a period of years and the maximum rate of flow for 24 hours during the same period may be represented approximately by the expression $Q (Max.) = Q (1 + 2A^{0.3})$, in which $Q (Max.)$ equals the maximum rate of discharge of a flood, and Q equals the greatest average rate of flow for 24 consecutive hours during a period of years. On streams throughout the country, "floods which are a certain ratio of the average yearly flood" occur with much the same frequency, and, on the average, the probable maximum flood in a period of years may be represented by the expression, $Q = Q (Ave.) (1 + 0.8 \log. T)$; "Coefficients may be obtained for streams by utilizing the foregoing relations to discount the effect of the length of period of observation and the size of the catchment area; these coefficients will serve as a gage for the flood-producing capacity of the streams; and the difference in value of these coefficients is caused by the various physical characteristics of the river and its catchment area, such as storage, soil conditions, etc., and by the difference in the prevailing rainfall conditions."

The storage of flood waters for irrigation: A study of the supply available from southern California streams, A. M. STRONG (*Proc. Amer. Soc. Civ. Engin.*, 39 (1913), No. 5, pp. 955-978, figs. 19).—Investigations on the quantity of flood water being wasted in southern California, and on that part of the waste which may be economically diverted and stored for use during an entire irrigation season, are reported.

Run-off records of the San Gabriel River for two seasons show that if it were possible to obtain storage for the excess run-off available for diversion at an expense warranted by its value, it would be possible to double the area now irrigated from the surface flow of the river.

There are said to be many small streams in southern California similar to this river, a large part of whose floods may be economically handled. Under the assumption that storage facilities are economically available, it is concluded that a diversion capacity of 2.25 second-feet per square mile of drainage area will assure sufficient supply for a reservoir storage of 200 acre-feet for each square mile, irrigating 40 acres, which at 2 cts. per inch per hour would warrant an expenditure of \$13,250 per square mile of drainage area. Similarly, there would be available for increasing the underground storage a supply sufficient to irrigate 45 acres.

Irrigation pocket book, or facts, figures, and formulas for irrigation engineers, compiled by R. B. BUCKLEY (*London, New York, Calcutta, and Bombay, 1913, 2. ed., pp. 483, pl. 1, figs. 80*).—This, the second edition of this pocket book, contains about 60 pages of "facts, figures, and formulas" concerning irrigation engineering which did not appear in the first edition (E. S. R., 29, p. 289).

Drainage and irrigation: Method and cost of manufacturing sand cement with results of tests of the modified cement, L. E. SALE (*Engin. and Contract., 40 (1913), No. 23, pp. 623-628, figs. 6*).—This article describes the methods of manufacturing sand cement employed by the United States Reclamation Service at the Lahontan Dam and gives the results of tests of the modified cement in regard to sand and cement ingredients, tensile and compression strength, porosity of mortars and concrete, and effect of hot water and alkali.

In the sand or so-called "silt" the elements silica and alumina were found to predominate, while the cement analyses showed a high lime content and also sulphuric anhydrid. It was found that an amount of silt, up to 25 per cent of the volume of the sand used, tends to increase the strength and imperviousness of the concrete, it being unnecessary to wash the sand on this account.

Cement replaced by silt, and the two only mechanically mixed, decreased the strength of the concrete in direct proportion to the increase of silt, and too fine grinding of the blend resulted in a flash set. The ideal product was found to consist of a mixture of 50 per cent silt and 50 per cent Portland cement, ground until an average of 82 per cent passed a No. 200 sieve. Sand cement concrete required more mixing and more water than pure Portland cement concrete, and after being placed in forms cracked and disintegrated unless watered constantly for a period of from one to three weeks, depending on the weather. It was further found that hot water could not be used in mixing. The flour in the silt is thought to combine chemically with certain elements in the cement, thus increasing the strength.

From the alkali test it is concluded that an impervious concrete which will resist alkali action can be made with sand cement without resort to "alkali proof" compounds or waterproofing materials such as soap, alum, etc. It is further concluded that sand cement concrete is essentially a warm weather concrete.

Pressure tests of jointed concrete pipes (*Engin. News, 70 (1913), No. 23, pp. 1126, 1127, fig. 1*).—Tests are reported of the resistive qualities under severe internal pressure conditions of lines of 63, 84, and 48 in. reinforced concrete pipe of 1:1½; 2½ mixture and having special "lock joints". The pipe is cast in 4 ft. lengths and is provided with a bell end and a groove on the inside of the pipe at the joint. In making the final joint the reinforcements of the adjoining pipes are overlapped in the internal groove, and the groove filled up flush with the inside of the pipe by pouring in a cement grout. In addition there is a specially prepared plaster interior cover to the joint.

The 63-in. pipe withstood an internal pressure of 54 to 56 lbs. per square inch and the 84-in. pipe an internal pressure of 65 lbs. per square inch without leakage through pipe or joints. The 48-in. pipe withstood 40 to 55 lbs. internal pressure for 48 hours without leakage. A steady increase of pressure in this pipe up to 90 lbs. per square inch caused sudden failure at that point.

Small cube pavements of Monroe County, [New York], W. G. HARGER (*Engin. Rec., 68 (1913), No. 23, pp. 624-626, figs. 7*).—Service tests and cost data are reported of surfacing country roads with 2-in. blocks of vitrified clay ash, vitrified shale, and concrete.

It was found that the cube form of pavement is flexible under frost action, thus making it suitable as a surfacing on a macadam base. It is stable under traffic and can be successfully held in place with a macadam or gravel shoulder without the formation of a rut. It gives a satisfactory surface in wet and dry weather, and can be laid late in the season, requiring comparatively simple inspection.

Gravel concrete cubes unprotected by a bituminous surface coat were complete failures under medium and heavy traffic, but when protected by such a coat they served satisfactorily under light traffic. Vitrified pipe clay cubes laid on concrete with grouted joints wore well under heavy automobile traffic and medium team traffic.

Local clay ash cubes laid on macadam base with sand joints withstood light traffic. Vitrified shale cubes laid on a macadam base with wide sandy loam joints stood medium traffic, and when laid on a macadam base with close joints filled with sand or clay loam and oiled or tarred they stood heavy traffic.

It is concluded that concrete cubes at the present cost can compete economically in only a few cases with macadam. Vitrified shale cubes can compete economically with brick roads for the lighter travel, and will probably be able to compete economically with bituminous macadam in many localities in the near future.

Regulations for accident prevention in the use of electricity in agriculture, NOETEL (*Mitt. Deut. Landw. Gesell.*, 28 (1913), Nos. 20, pp. 296-298; 21, pp. 310-314).—A set of rules and regulations are given and various protective arrangements described for the prevention of accidents in the use of high tension electrical power in agricultural work.

Fuel and lubricants for internal combustion engines, B. H. ARNOLD (*Gen. Elect. Rev.*, 16 (1913), No. 10, pp. 708-713, figs. 2; *West. Engin.*, 3 (1913), No. 5, pp. 369-373, figs. 2).—A discussion is given of the antecedents of gasoline and naphtha as well as of their use in order to show why the specific gravity indicates very little of the relative suitabilities of various gasolines and naphthas. The subjects taken up in the discussion are petroleum, its occurrence, composition, and refining, the use of gasoline and naphtha in the engine, specifications and purchase, and the possibilities of other liquid fuels including alcohol and benzol. Under the subject of lubrication it is concluded that the practical working test is by far the best and surest means of determining the merits of a lubricating oil.

Hay and grain elevator, GRÄF (*Deut. Landw. Presse*, 40 (1913), No. 89, p. 1062, figs. 2).—A grain and hay elevator, consisting essentially of an endless chain fitted with carriers for hay or sacks of grain which operates in a vertical shaft, is diagrammatically illustrated and described.

Methods of hitching horses, M. RINGELMANN (*Jour. Agr. Prat.*, n. ser., 26 (1913), No. 43, pp. 530-532, figs. 4).—Methods and devices for hitching horses in stalls, which permit both vertical and lateral freedom in feeding, resting, and lying down, are illustrated and described.

Water supply, plumbing, and sewage disposal for country homes, R. W. TRULLINGER (*U. S. Dept. Agr. Bul.* 57 (1914), pp. 46, figs. 38).—This bulletin treats in a simple manner of (1) water supplies with reference to their sanitary aspects, (2) pumping, storage, and distribution of water, (3) simple and durable plumbing systems, and (4) the safe and satisfactory disposal of sewage and waste.

In a detailed discussion of the contamination of farm water supplies and dangers resulting therefrom, such supplies are divided into three classes, which in the order of their liability to pollution are surface supplies, shallow underground supplies, and deep underground supplies. The construction and use of cisterns, cistern filters, and of a water still for household use are described and illustrated, as are also types of wells and methods of sinking; and methods of protection for deep and shallow wells and springs. Attention is called to the frequent pollution of both deep and shallow wells from local sources, and it is stated that the safety of water supplies when near sources of possible surface pollution often depends largely on the character and quality of the material from which they are obtained.

The section on pumping, storage, and distribution includes a detailed description of the gravity, pneumatic tank, and autopneumatic systems of water supply, and a discussion of pumping and types of pumps, including hydraulic rams, with hints on installation and operation.

The important points to be considered in the arrangement of a plumbing system are stated as (1) durability of material and construction, and (2) simplicity. A warning is given against the use of lead pipe or lead lined receptacles for drinking water in private systems.

The process of sewage disposal described is partly mechanical and partly bacterial, consisting of (1) preliminary or septic tank treatment, and of (2) application to a natural soil by surface or subsurface distribution or to a specially prepared filter. This section also discusses the design, location, and construction of single and double chamber septic tanks and final disposal systems, including a grease trap and sewage diverting gate.

"The septic tank, although air-tight and supposedly water-tight, should be located as far from the house and the well or spring as convenience and local surroundings will permit, thus reducing the danger of pollution or nuisance in case of leakage or improper operation of the system. . . . Contrary to the usual opinion, small sewage systems require some watching and care. It is well to study the system and watch the action in the entire plant for any signs of clogging or waterlogging." If the sewage is applied continuously to the disposal system and in such quantities that the system is kept saturated, the filter or disposal area is said to become waterlogged and "sewage sick" and ceases to be effective.

Tables of working data accompany the discussion.

Stable ventilation and ventilation of rural dwellings, W. PINKEMEYER (*Landw. Ztschr. Rheinprovinz*, 14 (1913), No. 45, *Sup.*, pp. 8, figs. 8).—The author discusses from the German viewpoint the location and construction of rural dwellings and barns relative to protection from the weather and insects, light and warmth, and proper ventilation. He states that dwellings should face the south, horse barns the east, cattle barns the east or southeast, and hog houses the south and southeast. He takes up roof construction in relation to ventilation and prefers the reinforced concrete to the wooden roof. In addition he discusses the proper size and location of windows and ventilating shafts. Different methods of construction are diagrammatically illustrated.

[Paint tests], E. F. LADD, W. F. WASHBURN, and G. F. EKEY (*North Dakota Sta. Rpt.* 1912, pt. 3, pp. 292-295, 491-564, figs. 52).—Photographs are given of fences painted in 1907 and 1908 with data on the number of knots in and character of the fence lumber and analyses of paints used in 1911. Data of house tests of paints are reported as are also results of inspection of both houses and fences in 1912. No conclusions as to the wearing qualities of the paints are drawn.

[Analyses of paints], E. F. LADD and ALMA K. JOHNSON (*North Dakota Sta. Spec. Bul.*, 2 (1913), No. 20, pp. 353-356).—This gives the results of examining the vehicle and pigment used in making up 8 samples of paints.

RURAL ECONOMICS.

Agriculture, 1909 and 1910.—V, General report and analysis (*Thirteenth Census U. S.*, 5 (1910), pp. 927, pls. 57, figs. 112).—This volume contains a general report and analysis of all the data collected by the Thirteenth Census regarding agriculture by States and geographic divisions. The information relates to population, farms, and farm property; number, acreage, and value of farms classified by tenure, mortgage debt, color, and nativity of farmers; number of live stock and of domestic animals sold or slaughtered; live stock

products; value of all crops and principal classes thereof, and acreage and production of all crops; and selected farm expenses and receipts. The farms are also classified by sizes with their acreage and number of live stock. Data also are given showing farms and acreage irrigated; irrigation works; cost of construction, operation, and maintenance; crops irrigated—acreage, production and value; and acreage irrigated and irrigation enterprises by States.

For the principal items data from the previous census are given for comparative purposes. The more important facts are illustrated by diagrams and maps.

Agriculture, 1909 and 1910.—VII, Reports by States, with statistics for counties (Nebraska-Wyoming) (*Thirteenth Census U. S.*, 7 (1910), pp. 1013, figs 61).—This volume completes the report previously noted (*E. S. R.*, 29, p. 88).

Only 27 per cent of tillable land under cultivation (*U. S. Dept. Agr., Weekly News Letter*, 1 (1914), No. 25, pp. 2, 3).—It is estimated that of the 1,900,000,000 acres of land in the United States 1,140,000,000 are capable of cultivation, 361,000,000 acres are nontillable but valuable for pasture and fruit, and 399,000,000 acres are of no agricultural value. According to the census of 1909, only 311,000,000 acres were in crops. It is stated that the extension of the tillable area will be at greater expense for clearing, drainage, irrigation, etc., and that the increased production of the future will be the result of increased yields per acre as well as the extension of the tillable area.

Agriculture in other lands, A. J. PERKINS (*Adelaide, So. Aust.*, 1912, pp. 123, figs. 26).—This pamphlet gives a description of agricultural conditions, utensils, live stock, special crops, and systems of cultivation as noted by the author in his travels through Egypt, Greece, Turkey in Asia, Great Britain, France, Spain, and Tunis.

Agricultural and live stock statistics of Finland (*Statist. Årsbok Finland*, n. ser., 10 (1912), pp. 101–124).—This is the annual report of Finland giving by governments statistics of acreage, production, and consumption of the principal farm crops for 1910, the butter and cheese manufacture and trade for 1907–1910, and the number of domestic animals for 1910. Comparative data are given for Finland as a whole beginning with 1878.

Rural population of Finland (*Statist. Årsbok Finland*, n. ser., 10 (1912), p. 7).—In 1800 the population of the rural communities was 786,055; in 1850, 1,531,419; in 1900, 2,372,949; and in 1910, 2,658,324, forming 94.4, 93.6, 87.5, and 85.3 per cent, respectively, of the total population. Prior to 1904 there was an excess of females but since that date males have predominated.

The production, consumption, and price of wheat, P. LEROY-BEAULIEU (*Econ. Franç.*, 41 (1913), II, Nos. 36, pp. 341–343; 38, pp. 415–417; 40, pp. 484–486).—The author states that although the production of wheat between 1880 and 1910 increased 66 per cent the population increased only 30 per cent. The failure of the wheat production to keep pace with the increase in population in Germany, Belgium, France, Great Britain, Italy, Netherlands, and Switzerland has caused their average annual imports to increase from 71,000,000 to 127,000,000 quintals between 1881–1885 and 1906–1910. He also discusses the wheat situation in the principal exporting countries and the possibilities of increasing their production to meet the future demands.

The economic significance of large and small establishments in agriculture, E. KEUP and R. MUHRER (*Die Volkswirtschaftliche Bedeutung von Gross- und Kleinbetrieb in der Landwirtschaft*, Berlin, 1913, pp. XXXI+414).—This report gives in detail the methods employed in studying the effect of intensive agricultural settlement in the eastern part of Prussia, and points out that there has been a marked increase in both cereal and live stock production and in the revenue from crops per acre.

Revision of British land laws (*Breeder's Gaz.*, 65 (1914), No. 4, pp. 163, 164, figs. 6).—This article contains a discussion of the methods that are advocated in reforming the British system of land tenure, some of which are supervision of land transfer, registration of title, protection against damage by game, minimum wages for agricultural laborers, and the erecting of cottages for small holders.

The practical side of local organization in agriculture, J. A. HERR (*Penn. Dept. Agr. Bul.* 233 (1912), pp. 16).—The author describes what he considers the essentials for success in agricultural organization and gives the by-laws of two successful farmers' organizations in Pennsylvania.

Year book of international cooperation, H. MÜLLER (*Year Book Internat. Coop.*, 2 (1912), pp. V+255, pl. 1).—The first part of this volume is devoted to statistics relating to cooperative societies and gives for practically all European countries, Japan, and the United States information concerning the area, population, agricultural workers, trade, number and membership of the various cooperative societies, types and amount of business transacted, and other facts relating to their organization. The development of wholesale cooperation between 1901 and 1910 is also discussed.

In the second part the author discusses the influence of Dr. William King, the first editor of the *Cooperator*, on cooperative organizations in England under the subjects of purpose, nature, economic theory, and principles of cooperative societies, trade unions and their relations to cooperative societies, and the system of competition and cooperation.

The Jewish agricultural and industrial aid society, L. G. ROBINSON (*Jewish Agr. and Indus. Aid Soc. Ann. Rpt.* 1913, pp. 70, fig. 1).—This is the annual report for 1913 and gives the number and amount of loans granted, closed, and outstanding for 1900 to 1913, the mode of operation, and a description of the credit unions, farm labor departments, and cooperative fire insurance among the Jewish farmers.

The organization of land credit in Argentina, P. E. SMETS (*L'Organisation du Crédit Foncier dans la République Argentine*. Antwerp, Belgium, 1911, pp. 85).—The author discusses the agricultural industries, land proprietorship, railroads, mortgage and personal credit, agricultural warrants, rates of interest, and the legislation of the federal and provincial governments regarding land credit, and describes the national mortgage bank and the foreign institutions furnishing land credit in Argentina.

Agricultural cooperation in Germany and in Ireland, T. B. THACKSTON (*Spartanburg, S. C.*, 1913, pp. 71).—The author outlines agricultural cooperation in Germany and Ireland and shows how the methods employed in these countries may be adapted to meet conditions in South Carolina.

Annual report on the working of cooperative societies in the Bombay Presidency including Sind, R. B. EWBANK ET AL. (*Ann. Rpt. Work. Coop. Credit Soc. Bombay Pres.*, 1912-13, pp. 11+57+3, pl. 1).—Included in this report are tabulated statistics giving details for each society as to its location, receipts and disbursements, rate of interest, assets and liabilities, profits and loss, and classification of loans.

Cooperative credit movement in India, H. D. BAKER (*Daily Cons. and Trade Rpts.* [U. S.], 17 (1914), No. 37, pp. 577-584).—The author explains the function of the Government in establishing cooperative societies, discusses their progress in the different parts of British India, and gives a list of documents containing more detailed information.

The granger movement, S. J. BUCK (*Cambridge, Mass., and London*, 1913, pp. 384, figs. 5, pls. 4).—The author describes the economic conditions of agriculture at the time the "granger movement" began, the history of its organization, its influence on railway legislation, its business organization, and social

and educational features. He concludes that this movement had a marked influence in bringing the railroads under governmental control and in determining the scope and plans of various other agricultural organizations. The greater part of the book is devoted to conditions between 1870 and 1880. A very complete bibliography is included.

Rural social centers in Wisconsin, C. J. GALPIN (*Wisconsin Sta. Bul.* 234 (1914), pp. 38, figs. 20).—The author claims that because the land worker is exempt from close contact with people he is handicapped in the development of his social institutions, that large scale acquaintance must become a rural policy and ideal, and that "fundamental mediums of acquaintance must supplement the casual in order that the constructive power of the community may be recognized and organized into effective institutions to reinforce each individual in his life struggle." He describes a number of typical rural social centers in Wisconsin, including a rural school, rural club, rural church, and rural municipal center, and indicates how each is influencing the social life of the community.

AGRICULTURAL EDUCATION.

Signs of progress in 1913 (*Ontario Dept. Ed., Agr. Ed. Bul.* 7 (1913), pp. 19, figs. 9).—This bulletin contains (1) a list of 174 rural and village schools in Ontario that are endeavoring to qualify for grants for agricultural instruction, as compared with 17 schools receiving grants for this work in 1910, 33 in 1911, and 100 in 1912; (2) suggestions to teachers that will help them to judge for themselves as to the quality of their work, (3) a list of the schools that have organized progress clubs among the pupils in their higher classes, and (4) an article on the Regeneration of Rural Schools, by M. D. Moffat, in which he outlines what Ontario is doing in introducing utility subjects into the schools.

The present organization and status of agricultural instruction in Belgium, J. VANDER VAEREN (*Rev. Gén. Agron., n. ser.*, 22 (1913), Nos. 2, pp. 75-85; 3, pp. 122-127; 4, pp. 174-181; 5-6, pp. 228-232; 7-8, pp. 280-284).—The various types of agricultural schools and courses comprised in the system of agricultural education in Belgium are described.

Instruction in rural home economics abroad, P. SCHINDLER (*Ann. Sci. Agron., 4. ser.*, 2 (1913), II, No. 6, pp. 727-742).—An account is given of what has been done in the teaching of domestic science in European countries outside of France.

Community or local extension work by the high school agricultural department, W. G. HUMMEL (*California Sta. Circ.* 109 (1914), pp. 31, figs. 7).—This circular discusses the advantages and opportunities of local extension work in agriculture, which aims to connect school life with the home life of the community, possible arrangements as to time available for the teacher to carry on this work, its financial support, forms of the work, and what various high school agricultural teachers have actually achieved in these lines and their methods. The author finds that this work is no untried theory, and that "properly conducted, it promotes agricultural knowledge, prosperity, and community spirit among farmers; vitalizes and emphasizes the value of school instruction; and, not least important, furnishes a useful avenue through which the agricultural experiment station may both keep in close touch with farm conditions and needs and disseminate the results of its investigations."

To help boys go to school and yet make a good living raising corn and pigs (*Oreg. Countryman*, 6 (1913), No. 3, pp. 145, 146).—A proposed plan for combining corn and pig clubs with crop rotations on a 2-acre tract is described. The basic idea is that under this system the boy will have plenty of time to

go to school and yet can make enough money from his corn and pigs to support himself and pay for his education.

The county farm adviser, B. H. CROCHERON (*California Sta. Circ. 112* (1914), pp. 12).—This circular contains a brief explanation of the farm adviser movement and of what the farm adviser is, does, and costs, followed by a copy of the constitution and by-laws for the Humboldt County Farm Bureau as an example of a permanent form of organization, and by a description of a day spent with a farm adviser.

Announcement of correspondence courses in agriculture, W. G. HUMMEL (*California Sta. Circ. 113* (1914), pp. 12).—Announcement is made of 32 courses intended for farmers, each dealing with a special type of farming, with a brief description of each.

Rural education conferences, 1913 (*Ontario Dept. Ed., Agr. Ed. Bul. 9* (1913), pp. 52, figs. 14).—This bulletin comprises the addresses on rural education given at the Ontario Educational Association, Toronto, March 26 to 28, and abstracts of the addresses given at the Inspectors' Short Course and Rural Education Conference at the Ontario Agricultural College August 4 to 8.

Addresses given at the rural life conference, Middlebury College, compiled by R. McFARLAND (*Middlebury, Vt., 1913*, pp. 48).—This report contains addresses concerning various phases of rural life in Vermont and gives an extensive list of books relating to rural life and rural activities.

Agriculture in outline for the use of teachers and pupils in schools of all grades, L. O. HAYNES (*Smoot, W. Va. [1913]*, pp. 87).—This book is the result of several years' experience in teaching agriculture, especially in summer normal schools. It is intended to be a guide to the teacher in assigning lessons to the student and preparing the lesson assigned, and to save time in reviewing for an examination.

A text-book of sanitary and applied chemistry or the chemistry of water, air, and food, E. H. S. BAILEY (*New York and London, 1913*, 3. ed., rev., pp. XX+345).—A revised edition of an earlier publication (E. S. R., 18, p. 711) in which statistical matter has been brought up to date.

Course in experimental plant physiology (*Philippine Agr. and Forester, 2* (1912), No. 1-3, pp. 35-46).—A description is given of the course in experimental plant physiology in the Philippine agricultural college. The course in agriculture in this college has its foundation in plant physiology. An outline and directions for experiments are given.

Soils and crops, T. F. HUNT and C. W. BURKETT (*New York, London, 1913*, pp. XIII+541, pl. 1, figs. 463).—This book has been prepared to aid the teacher in presenting the subject matter to pupils between the ages of 14 and 18. Each lesson contains a note to the teacher and 15 paragraphs in which are developed the ideas, or set of ideas, set forth in the lesson. The authors have endeavored to lead the pupil from the simple and known to the unknown and complex, and to have conclusions follow logically from the statements made. In addition to the recitations matter has been provided for laboratory or practical tests, including many experiments and suggestions as to how to conduct them. No collateral reading is suggested for pupils, as the authors believe they have included in the book as much subject matter as can be covered wisely in 16 weeks by pupils of high school age.

Nature, effects, and maintenance of humus in the soil, E. O. FIPPIN (*Cornell Reading Courses, 3* (1913), No. 50, pp. 28, figs. 18).—This is a popular discussion of the subject of humus in the soil and contains, among other things, diagrams representing the means by which the supply of humus is maintained in the soil, the sources of organic matter, the processes by which it is changed to humus, the proportion of humus in soil materials, and the final product of

the decay of organic matter and humus. A suggested list of books for use in advanced reading on the subject is given, together with a discussion which contains questions on important points.

Laboratory manual of cereals and forage crops, G. LIVINGSTON and M. YODER (*Columbus, Ohio, 1913, pp. 90*).—Almost all of the exercises contained in this manual have been given in the past two years as laboratory exercises in connection with the regular cereal and forage crop course at the Ohio State University. More than one laboratory period of 2 hours per week will be required to complete all of the exercises.

Our domestic birds, J. H. ROBINSON (*Boston, New York, Chicago, and London [1913], pp. X+317, pl. 1, figs. 236*).—The object of this elementary textbook is to tell in plain language the things that every one ought to know about poultry, pigeons, and cage birds.

Nature collections for schools (*Ontario Dept. Ed., Agr. Ed. Bul. 8 (1913), pp. 23, figs. 9*).—This bulletin is intended as a guide to teachers and pupils in making nature study and agricultural notebooks; plant, insect, historical, and miscellaneous collections; a school bulletin board and museum cabinets; and conducting school fairs and children's competitions.

Boys' and girls' club and contest leaflet, C. D. STEINER (*Agr. Ed. [Kans. Agr. Col.], 5 (1913), No. 16, pp. 4*).—This leaflet deals with the family garden and the flower garden and contains information concerning their preparation and care.

Civic days (*Raleigh, N. C.: State Supt. Pub. Instr., 1913, pp. 46, figs. 9*).—This is a compilation of material for use in celebrating Arbor and Good Roads Days in the North Carolina public schools.

MISCELLANEOUS.

Twenty-fifth Annual Report of Louisiana Stations, 1912 (*Louisiana Stas. Rpt. 1912, pp. 32*).—This contains the organization list, a report of the director on the work of each of the stations, a list of the publications issued during 1912, and a financial statement as to the federal funds for the fiscal year ended June 30, 1912, and as to the state funds for the fiscal year ended November 30, 1912. The report of the department of entomology is abstracted on page 655 of this issue.

Twenty-fifth Annual Report of Maryland Station, 1912 (*Maryland Sta. Rpt. 1912, pp. XVIII+341, figs. 63*).—This contains the organization list; a report by the director on the organization, work, and publications of the station; a financial statement for the fiscal year ended June 30, 1912; and reprints of Bulletins 155-167, previously noted.

Twenty-sixth Annual Report of Michigan Station, 1913 (*Michigan Sta. Rpt. 1913, pp. 143-700, figs. 107*).—This contains reports of the director and heads of departments on the work of the station during the year, the experimental features of which are for the most part abstracted elsewhere in this issue; a financial statement for the fiscal year ended June 30, 1913; and reprints of Bulletins 268-271, Special Bulletins 59-61, Technical Bulletins 12-17, and Circulars 18-20, all of which have been previously noted.

Twenty-third Annual Report of North Dakota Station, 1912 (*North Dakota Sta. Rpt. 1912, pts. 1, pp. 35; 2, pp. 288, figs. 2; 3, pp. 289-569, figs. 63*).—Part 1 of this report contains the organization list, reports of the director and heads of departments, and a financial statement for the fiscal year ended June 30, 1912. An article on Sugar Beets in North Dakota is abstracted on page 638 of this issue.

Parts 2 and 3 constitute the report of the state food commissioner. Part 2 deals with food and sanitation and is abstracted on page 665 of this issue.

Part 3 deals with waters, wheats, paints, oils, and farm products, and includes in addition to articles relating thereto and abstracted elsewhere in this issue, analyses of a fertilizer, Paris green, a so-called quack-grass destroyer, sugar beets, and lignite coal.

Annual Report of South Dakota Station, 1912 (*South Dakota Sta. Rpt. 1912*, pp. 37).—This contains a report by the director on the organization, work, and publications of the station, a list of exchanges, a financial statement for the fiscal year ended June 30, 1912, and departmental reports, a portion of that of the horticulturist being abstracted on page 640 of this issue.

Twenty-third Annual Report of Wyoming Station, 1913 (*Wyoming Sta. Rpt. 1913*, pp. 135, figs. 17).—This contains the organization list; a financial statement for the fiscal year ended June 30, 1913; reports of the director and heads of departments; meteorological observations noted on page 619 of this issue; an article entitled Analyses of Some Wyoming Larkspurs, I, by S. K. Loy, F. W. Heyl, and F. E. Hepner, previously noted from another source (E. S. R., 30, p. 577); an article entitled Some Constituents of the Leaves of *Zygadenus intermedius*, III, by F. W. Heyl and F. E. Hepner, previously noted from another source (E. S. R., 30, p. 412); an article on The Transmission of Swamp Fever in Horses, abstracted on page 687 of this issue; and reprints of the following press bulletins: Pasture crop for pigs, preparation of lands for first crops, treatment of loose and stinking smut, the formaldehyde treatment for grain and potatoes, importance of proper seed, hay and root crops for the dry farmer, the extermination of prairie dogs and gophers, and state and county fairs.

Station publications, R. J. H. DeLoach (*Georgia Sta. Circ. 69* (1913), pp. 8).—This circular explains the functions of an experiment station and presents lists of the bulletins of the Georgia Station to December, 1912, and the press bulletins or circulars to August, 1913.

Dr. K. W. Van Gorkom's East Indian cultivated plants, revised and edited by H. C. PRINSEN GEERLIGS (*Dr. K. W. Van Gorkom's Oost-Indische Cultures. Amsterdam, 1913, vols. 1, pp. VIII+399, figs. 92; 2, pp. VIII+911, figs. 292; 3, pp. VIII+874+XXVIII, figs. 213*).—The revision of this work is a comprehensive treatise in 3 parts, as follows:

Part 1, The Climate in the Dutch East Indies, by J. P. van der Stok (pp. 1-31); The Soil, by D. J. Hissink (pp. 33-116); Manures, by A. Van Bijlert (pp. 117-163); Growth, Respiration, and Nutrition of Plants, and Propagation, Heredity, and Hybridization, by F. A. F. C. Went (pp. 165-237, 239-312); Plant Diseases and their Dissemination, by J. Westerdijk (pp. 313-399). Part 2, Rice, by J. J. Paerels (pp. 1-64); Sugar Cane, by H. C. Prinsen Geerligs (pp. 65-163); Oils and Waxes, by J. J. A. Wijs (pp. 165-254); Tea, by A. W. Nanninga (pp. 255-353); Cacao and Cola, by F. W. T. Hunger (pp. 355-458, 459-502); Tobacco, by A. van Bijlert (pp. 503-627); Coffee (pp. 629-758); Spices, by H. J. Wigman (pp. 759-883); Ethereal Oils, by P. van Romburgh (pp. 885-911). Part 3, Indigo, by C. J. van Lookeren Champagne (pp. 1-56); Quinin, by P. van Leersum (pp. 57-176); Wood, by A. H. Berkhout (pp. 177-242); Secondary Crops (maize, millet, grasses, soy beans, and beans) and Turnips and Other Root Crops, by J. J. Paerels (pp. 243-291, 293-338); Rubber and Gutta Percha, by P. van Romburgh (pp. 339-418); Fiber Crops, by J. Dekker (pp. 419-554); Sago, by J. J. Paerels (pp. 555-580); Fruits and Vegetables, by H. J. Wigman (pp. 581-658, 659-698); and Tanning Materials and Dyes and Forestry, by H. H. Zeijlstra (pp. 699-789, 791-874).

Collection of coefficients for the conversion of weights, measures, and moneys into the decimal metric system, compiled by U. Ricci (*Recueil de Coefficients pour la Conversion des Poids, Mesures et Monnaies au Système Métrique Décimal. Rome: Inst. Internat. Agr., 1912. pp. 63*).

NOTES.

California University and Station.—The enrollment in the correspondence courses, established only a few months ago, is now 7,000, of whom 6,000 students are taking courses in agriculture. The largest registration has been in poultry raising.

Richard Laban Adams has been appointed assistant professor of agronomy and assistant agronomist. Carl Spencer Milliken has been appointed assistant superintendent of agricultural extension, with headquarters at Riverside, and J. A. Armstrong assistant in agricultural extension in the college and station.

Georgia Station.—R. F. Crittenden, one of the oldest members of the board of directors, died March 8, and has been succeeded by W. D. Hammack of Coleman. A department of agronomy has been substituted for the department of agriculture created at the establishment of the station.

Idaho University.—W. H. Olin has resigned as director of the extension department to become agricultural commissioner for the Denver and Rio Grande and Western Pacific railways, entering upon his new duties April 1.

Indiana Station.—Chester G. Starr has been appointed assistant in swine production beginning April 15.

Massachusetts College.—The sixth annual farmers' week had an enrollment of over 1,500, considerably exceeding that of any previous year in spite of unfavorable weather conditions. Sections were provided in field crops and farm management, animal husbandry and dairying, poultry husbandry, fruit growing, market gardening, floriculture and forestry, home economics, and community development.

Missouri Station.—The forestry department has started an extensive experiment with 533 fence posts of 27 kinds of wood to test the economy of preservatives. The different treatments include charring, treating with hot carbolineum, and the use of hot creosote by the brush and tank methods.

Montana College and Station.—G. L. Martin, professor of dairying and assistant dairyman at the North Dakota College and Station, has been appointed assistant professor of dairying in the college, beginning May 1 and succeeding Roy C. Jones, who has accepted a position as county agriculturist with headquarters at Tillamook, Oreg. E. J. Quinn, of the office of the Indiana state geologist, has been appointed assistant chemist in the station vice H. H. Morris, resigned. H. B. Bonebright has resigned as assistant agricultural engineer. In the extension service, John C. Taylor and R. A. Blanchard have been appointed county agents for Fallon and Cascade counties respectively, George H. Cook specialist in agronomy, and W. J. Hartman live stock specialist. Joseph G. Morgan has been appointed assistant in the grain laboratory.

Nebraska University and Station.—The extension service has been reorganized as a division of the college of agriculture coordinate with the station. Superintendent C. W. Pugsley has been made director of the extension service. H. C.

Filley, assistant professor of farm management, has been promoted to be professor of farm management in charge of the department which had formerly been under the direction of Professor Pugsley.

H. B. Carpenter, adjunct professor of animal husbandry, died February 7. Professor Carpenter was a 1912 graduate of the University of Missouri. He was subsequently employed as instructor in animal husbandry in the University of Georgia, coming to Nebraska at the beginning of the present college year.

Cornell University.—Cooperative work has been arranged with Alfred and Rochester universities. At Alfred, the work is to be of an extension nature in charge of Prof. C. O. DuBois. That with Rochester University involves investigations of plant diseases among vegetable growers at Irondequoit. An expert will be appointed under the immediate direction of the University of Rochester and have the use of its laboratories. The New York State College of Agriculture will furnish a portion of the equipment, pay field expenses, and publish the results of the work.

George A. Works, assistant professor of agricultural education in the University of Minnesota, has been appointed professor of rural education and head of the department in the college of agriculture. He is expected to take up his duties July 1, and will offer courses in the university summer session.

W. W. Warsaw, a graduate of the Iowa College, has been appointed assistant in soil drainage to carry on demonstration work. R. J. Gilmore, assistant in the farm course, has accepted a position as head of the biology department of Huron College. John H. Comstock, head of the department of entomology and zoology, is to retire at the close of the present college year.

New York State Station.—E. L. Baker, associate chemist in charge of inspection analyses, has resigned to enter commercial work. His resignation became effective April 1, when Arthur W. Clark, assistant chemist, was given charge of the analytical work in the inspection of fertilizers, feeds, insecticides, and fungicides. Clarence D. Parker has been appointed assistant chemist.

Oregon College.—John E. Larson, superintendent of the Farm Improvement Association of Spink County, South Dakota, has been appointed extension agronomist.

Pennsylvania College and Station.—The new horticultural building which is nearing completion will be dedicated during commencement. This building will cost about \$120,000 and is to be thoroughly equipped for the teaching of vegetable gardening, pomology, floriculture, and landscape gardening.

A county farm bureau was organized in Lycoming County, March 13, making the tenth county in which an organization has been effected.

A cattle feeders' convention was held at the college April 3. Farmers were present from all of the districts where this industry is important and showed special interest in a feeding experiment with 60 cattle bought last fall for this specific purpose. A marked increase in interest among Pennsylvania farmers in the breeding and feeding of beef cattle is reported.

Maurice G. Kains, associate editor of the *American Agriculturist*, has been appointed professor of horticulture and horticulturist, the appointment to take effect July 15.

Rhode Island College and Station.—Walter E. Ranger has been elected president of the board of managers. Charles D. Kimball has been succeeded by Zenas W. Bliss, who will also act as vice-president.

Walter C. Irons, a 1913 graduate of the college, has been appointed assistant in field experiments and has entered upon his duties.

Wisconsin University and Station.—C. P. Norgord, associate professor of agronomy and associate agronomist, has also been appointed superintendent of farmers' institutes, vice George A. McKerrow, retired.

Wyoming Station.—C. J. Oviatt, state leader of farm management, resigned to take effect April 20, to accept a commercial position.

International Commission of Agriculture.—At a meeting held in Paris, February 23, this body considered the invitation extended by the Panama-Pacific International Exposition to hold the Eleventh International Congress of Agriculture at San Francisco in 1915. The decision was reached that it was impossible for the commission to organize such a congress at San Francisco, but that it held itself ready to undertake the sending of a European delegation to a congress organized by Americans.

The proposition of organizing agricultural groups in the governing bodies of the various countries into an international body was also discussed. The commission decided that a preferable procedure was the addition to its own membership of representatives of these groups and that it would welcome for consideration such questions as the national sections should deem it advisable to submit to it.

International Phytopathological Conference.—This conference was held in Rome, February 24 to March 5, with 50 delegates representing 35 countries in attendance. An international convention was proposed under which adhering countries would pledge themselves to enact legislation and administrative measures to prevent the dissemination of plant disease within their own borders, and especially to organize an efficient system of nursery inspection. The establishment in each country of one or more institutions for scientific research in plant diseases and the providing of phytopathological certificates for exported nursery stock were also advocated.

Sixth Annual Corn Exposition.—This exposition, which was held at Dallas, Tex., February 10-24, was of much educational significance. An unusually complete exhibit was made by this Department, covering 10,000 square feet of floor space, and including many subjects of agricultural and general educational interest. Nine branches were represented, including the Forest Service, the Weather Bureau, the Agricultural Education Service of this Office, the Office of Public Roads, and the Bureaus of Animal Industry, Plant Industry, Soils, Entomology, and Chemistry. Probably the most extensive portion of this exhibit was that dealing with the making and maintenance of good roads. This included a large number of models showing the various stages and methods of road making, the use of road machinery, and the value and use of different materials in road making.

Some very striking exhibits were also made by about 30 of the agricultural colleges and experiment stations, as well as by other educational institutions. The stations' exhibits, for the most part, dealt especially with some one important phase of their work. Thus, the Illinois Station gave special prominence to its corn breeding, Missouri to seed selection, Nebraska to studies of the amounts of moisture used by plants at different stages of their growth, Louisiana to its accomplishments in working out some of the problems of the sugar industry, Iowa to soil studies, California to orchard fumigation, Colorado to cereal breeding work, Wyoming to wool production, and South Carolina to cotton. Cornell University again exhibited the model for the rural community center.

American Association for the Advancement of Science.—At a recent meeting of the council, Dr. E. W. Allen of this Office was elected secretary of the new Section M, on agriculture. The selection of a sectional committee for the section and also its representative on the council was entrusted to the vice-president, Dr. L. H. Bailey, and the secretary of the section.

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VOL. XXX.

JUNE, 1914.

No. 8.

Modern sanitation in its various aspects has been neglected in the farm home and in rural communities to a surprising degree. Theoretically, as the Commission on Country Life reported in 1909, "the farm should be the most healthful place in which to live, and there are numberless farmhouses, especially of the farm-owner class, that possess most excellent modern sanitary conveniences. Still it is a fact that there are also numberless other farmhouses, especially of the tenant class, and even numerous rural schoolhouses, that do not have the rudiments of sanitary arrangement. Health conditions in many parts of the open country, therefore, are in urgent need of betterment. There are many questions of nation-wide importance, such as soil, milk, and water pollution; too much visiting in case of contagious diseases; patent medicines, advertising quacks, and intemperance; feeding of offal to animals at local slaughterhouses and general insanitary conditions of those houses not under federal or other rigid sanitary control; in some regions unwholesome and poorly prepared and monotonous diet; lack of recreation; too long hours of work."

This statement is abundantly corroborated by medical and sanitary statistics. Recent reports of the United States Public Health Service indicate the widespread prevalence in rural sections of such diseases as malaria, typhoid fever, and hookworm, which it has been shown are spread almost entirely through insanitary surroundings. Kellerman and Whittaker of this Department, working in cooperation with the Minnesota State Board of Health in collecting minute data upon seventy-nine selected and typical rural water supplies, found that fifty-nine were polluted, and concluded that "both farm and city are suffering from the careless management of rural sanitation."

The situation is the more serious since in general the health of the rural population is less safeguarded by public agencies than is the urban population. The farmer and his family are less closely in touch with the local health authorities, and lack the benefits of

medical inspection of school children and the comprehensive sanitary regulations, the enforcement of which does so much to secure and maintain hygienic conditions in the urban community with a well organized health department. Physicians also are less accessible in the country, are liable to be called at a more advanced stage of sickness, and in some regions medical attendance is relatively more expensive. The necessity is, therefore, the more emphatic for disease prevention.

Another important consideration is the relation of the farm to the city as that of producer to consumer. Not only does a diminished efficiency on the part of the farmers through disease represent an eventual economic loss to the whole nation, but actual infection may spread from country to city through the streams, the milk, the meat, vegetables, and other farm products. Entirely apart from the humanitarian point of view, there are incurred by the nation enormous aggregate losses from insanitary conditions on the farms, and the improvement of these conditions is a nation-wide obligation.

Undoubtedly, one important reason for the apparent apathy has been the lack of an intelligent realization of the inadequacy and menace of the prevailing practices. This is indicated by the experience of the Commission on Country Life. It will be recalled that the questionnaire which the Commission sent out included an inquiry as to whether the sanitary conditions of the farms of the neighborhood were satisfactory. Some correspondents replied in the negative, but the usual response of the more than 100,000 replies was to the effect that they were as good as could be expected, or as conditions would warrant. The hearings of the Commission in the field, however, developed a very different state of affairs. Through leading questions, intelligent farmers and their wives, country physicians, board of health representatives, and others, developed the fact that conditions were far from satisfactory, that little attention was paid to such matters beyond the bare necessities, that there was a quite widespread indifference to the teachings of modern sanitation, and that the barns and dairies were often more adequately provided for than the farm homes.

Fortunately, with the general advance in rural standards of living in recent years there has come about a considerable awakening of interest among farmers and representatives of rural communities along these lines, as well as among the public as a whole. Modern methods of communication and travel have to a great extent brought the rural districts into closer relationship with the towns and cities. The farmer learns of the improved general health and reduction in the death rate resulting from the decrease of the ravages of contagious disease, which has been brought about through the intro-

duction of such preventive measures as a sanitary water supply, proper methods for the disposal of sewage and garbage, and mosquito and fly extermination, and wishes to avail himself of these benefits. This is evidenced by the correspondence and other appeals received by this Department, the Public Health Service, the agricultural colleges and experiment stations, state boards of health, the agricultural press, and many other agencies, for reliable and practical information as to means of improving existing conditions.

The matter has in a measure attracted the attention of scientists and sanitarians, but the scientific contributions to the subject are still relatively fewer and less adequate than could be desired. The Public Health Service has given special attention to the campaign against the malarial mosquito and the house fly, and the devising of sanitary arrangements to prevent soil and water pollution. Among state boards of health which have been active may be mentioned those of Pennsylvania, Virginia, Minnesota, North Carolina, Indiana, Illinois, and Maine. The more strictly sanitary engineering features of the investigations of these boards have included studies of rural water supplies, particularly the shallow well as regards pollution from local sources, soil pollution, sewage and garbage disposal, and swamp drainage. In Pennsylvania, rural tuberculosis has been a special subject of inquiry.

During the last two years, the United States Bureau of Education has made an extended survey of the sanitary condition of rural schools in various States. Other surveys have been made in Connecticut, Vermont, New York, Idaho, Massachusetts, New Jersey, Pennsylvania, and Virginia, and a large amount of valuable data has been accumulated on this phase of the question.

The work of this Department in rural sanitation has for the most part been along broad lines, consisting in part of coöperation with state boards of health in the examination of rural water supplies, general studies of personal hygiene and nutrition, food and milk supplies, and of such diseases as typhoid fever, malaria, and hookworm, safe disposal of sewage, insects affecting man, and the improvement of home conditions. A large share of its work has consisted of issuing miscellaneous information to individual applicants through the agency of correspondence.

The importance of the subject is also becoming recognized by some of the leading universities and agricultural colleges. Harvard University, for instance, has recently announced a course in rural sanitation under its department of sanitary engineering, in which it is proposed to instruct engineers, health officers, and physicians in the design and construction of sanitary rural dwellings, water supply, sewage and waste disposal, dairy sanitation, handling of farm prod-

ucts, and other allied subjects. The rural engineering divisions of the Iowa State College, Cornell University, and the University of Wisconsin are among others which are handling one or more phases of the problem.

From these and other sources there has been accumulated a considerable amount of valuable data. The field is still far from exhausted, however, and there is abundant opportunity for further inquiry, whether conducted from the medical, economic, or engineering points of view. One special need is for additional studies of typical farms and rural communities for the primary purpose of standardizing farm sanitary conditions on the basis of locality, type of farm, and financial status of the farmer. There must be a more intimate knowledge of rural conditions and a better understanding of what remedies are practicable before scientific measures can be most effectively applied. Many farmers are financially unable to install the more expensive systems of heating, plumbing, and the like, and this class usually includes those who are most in need of improvements. The more urgent problem, then, is that of securing for this class of farmers sanitary surroundings at a cost commensurate with their means. These more elementary, but oftentimes nearly as puzzling conditions, merit more attention than they have hitherto received.

But in many instances the first work is to arouse public interest and appreciation, and effect improvements which will be relatively simple and inexpensive. Often a change of attitude grows out of an understanding of these matters, and much may be expected from suggestion and illustration. The desire for improvement and faith in it must precede any very considerable change, as it must in all methods of practice on the farm. It calls, therefore, for propaganda and educational work, and in this the personal contact and appeal are as essential as they are in dealing with the improvement of methods and practices on the farm. Hence, the methods of extension work and demonstration are specially suited to meet its needs, and the relationship of the subject to agriculture and home economics makes it one which will naturally receive attention. The new extension movement seems to furnish the first opportunity for a widespread dissemination of information and a campaign along these lines. And while it will naturally form only an incidental feature of the larger work of agricultural extension, it may well result in an awakening growing out of broader intelligence. Already the Iowa College has organized in its extension division a distinct section on rural sanitation, while other institutions are giving some phases of it attention, either as a part of their extension work in rural engineering or in connection with their demonstrations in home economics.

As an example of the kind of service that may be rendered there may be mentioned the fact that in some States the demonstration agents are supplied with a spray pump and materials for spraying stables and manure piles to keep down the breeding of flies. The demonstrations which they have given have proved instructive in remedying a condition which has too commonly been accepted as inevitable.

In another State, the keeping of a pig under sanitary conditions with the avoidance of objectionable odors and fly breeding has been demonstrated. By the use of a pen with cement floor and proper conditions for cleanliness the keeping of a pig on a small place or in town is made possible, furnishing a means for garbage disposal, and hence a source of revenue. Already the extension service in many States has been led into numerous features in this field. They develop very naturally out of the close contact which demonstration work provides.

It has already been pointed out that the farmer himself, rather than any external agency, must be the main dependence in a campaign of bettering sanitary conditions. Much can be done, however, to open his eyes and subsequently to point out the way. Thus, it is certain that in many a case needed improvements have been delayed because of the supposed heavy outlay. Not always is it realized that the postponement may necessitate not only more of a direct expense for medical treatment, but sometimes an overwhelming secondary loss through inability to cultivate a crop, to tend live stock, or to transact other important business. It should frequently be possible to convince the farmer by actual figures that the cost of relocating a dangerous water supply, of screening the house, or of draining a swamp may be many times less than the ultimate expense incident to an attack of typhoid or malaria in his family. It should also be a comparatively simple matter for the sanitary engineer to present to the farmer designs of more or less elaborate water supply, plumbing, and sewage disposal systems well adapted to farm homes, as is now done for stables, silos, and other farm buildings. Some of these may be practicable only for the well-to-do farmer who is able to consider comfort and convenience even at some initial outlay. For the farmer of average means, however, it is possible to point out direct protective methods against disease which he may apply immediately, such as lining his well, screening windows, destroying fly breeding places and rat harbors, providing for removal of slops, garbage, manure, etc., ventilation, and when circumstances demand it, boiling his drinking water. These measures will yield a considerable measure of benefit and protection, and will constitute a powerful impetus to lead him to adopt some of the more expensive projects when financially able.

Another phase of farm sanitation which is in a measure being cared for by this Department, state boards of health, and some agricultural colleges, is that which has to do with the handling of farm produce, such as milk, butter, and other perishable goods. Legislation, in requiring the inspection of dairy stock and of milk products, etc., protects the consumer in a way, but if the farm dairy is unclean or the water supply polluted, such measures will still fail to produce clean milk and butter. It is obvious that such a farm must be kept in a much better sanitary condition than might be tolerated upon the ordinary farm. This will involve an increasing system of inspection, but to be really effective this must also be for a time largely a campaign of education. This is already recognized in many cities, which have devoted considerable attention to personal instruction and help of dairy producers. What is being done in the dairy line might well be extended to other food products, whose proper care and handling are matters for public concern.

In addition to preventing the spread of communicable diseases, the general problem of rural sanitation also involves the improvement of the general health and well-being of the farmer and his family so that they may be better able to resist not only the communicable diseases, but also the noninfectious or constitutional diseases which are also important factors in the death rates of rural districts. Instruction in personal hygiene is even needed in some cases, especially in the case of school children upon whose minds such information will produce a greater impression and lead to better results than is likely to be the case with older people whose habits of living have become more or less fixed. This phase of the problem is hardly one for the extension worker, but it opens wide another door of opportunity for the rural school, and perhaps for such agencies as the newly organized town and country nursing service of the American Red Cross. Its effective utilization will, of course, involve the adequate training of the teacher and the nurse, and in many parts of the country a radical improvement in the sanitary condition of the school building itself.

In many communities this phase might well constitute the beginning of the campaign for improvement in rural sanitation, and the reconstructed rural school become the starting point of a demonstration to be extended to the individual home through the efforts of the college extension staff. Such a campaign, if successful, would do much to make farm life at once more profitable, more healthful, and more attractive, and by so doing contribute to safeguard the food supply, and therefore the health and the efficiency of the nation.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

Chemistry, inorganic and organic, C. L. BLOXAM (*Philadelphia, 1913, 10. rev. ed., pp. XII+878, figs. 313*).—This is the tenth edition of this well-known work, which has been rewritten and revised by A. G. Bloxam and S. J. Lewis.

Biochemical hand lexicon, edited by E. ABDERHALDEN (*Biochemisches Handlexicon. Berlin, 1914, vol. 8 (Ergänzungsbd. 1), pp. VI+507*).—In this work, which is the latest volume of the series, the sections included are Carbohydrates, by G. Zemplén (pp. 1-366); Fats and Waxes, by A. Grün (pp. 367-460); Phosphatids, and Protagon and Cerebrosids, by D. Fuchs (pp. 461-472); Sterins, and Biliary Acids, by A. Fodor (pp. 473-500). For earlier volumes, see previous notes (E. S. R., 26, p. 106).

Volatility of lactic acid, E. B. HART and J. J. WILLAMAN (*Jour. Amer. Chem. Soc., 35 (1913), No. 7, pp. 919-923*).—A polemic. See other notes (E. S. R., 28, pp. 109, 609; 29, p. 712). The facts pointed out in the present paper, according to the authors, warrant the following conclusions:

"Lactic acid is but slightly volatile in steam at 100°. The amount that passes over in the distillation of volatile acids from silage is insignificant, being equivalent to not over 3 or 4 cc. tenth-normal alkali in 4 liters of distillate. Lactic acid is not sufficiently volatile to enable one to calculate a Duclaux curve for it, as only about 3 per cent passes over in the 100 cc. It is suggested that the higher results of Dox and Neidig in their experiments on the volatility of lactic acid may be due to carbon dioxid in the water used, or to volatile impurities in the lactic acid."

Phytic acid in cotton-seed meal and wheat bran, J. B. RATHER (*Jour. Amer. Chem. Soc., 35 (1913), No. 7, pp. 890-895*).—Previously noted from another source (E. S. R., 27, p. 611).

Studies on melanin.—V, A comparison of certain nitrogen ratios in black and in white wool from the same animal, R. A. GORTNER (*Jour. Amer. Chem. Soc., 35 (1913), No. 9, pp. 1262-1268*).—Studies in this connection have been previously noted (E. S. R., 23, p. 778; 27, pp. 468, 671). Acting on the assumption that melano-proteins might be formed by the oxidation of some components of the keratin structure an analysis of black and white wool taken from the same animal was made. This was done with the hope of being able to note a chromogen as a part of normal wool structure or possibly as a foreign secretion in the hair follicle "solely for the purpose of pigment formation and not utilized in the elaboration of the hair structure when there is no oxidase present to cause pigmentation, or when there is an inhibition of pigment formation."

The chemical group characteristics of the various amino acids were studied by D. D. Van Slyke's method.

"The averages of two analyses agree with each other remarkably well, with the exceptions that the humin nitrogen from the black wool is 3.45 per cent in excess and the amino nitrogen in the filtrate from the bases is 2.5 per cent less than that in the white wool. The excess of humin nitrogen is due to the presence of pigment. There is no necessary relationship between the lack of amino nitrogen in the filtrate from the bases and the excess of humin nitrogen. The nitrogen content of white wool was found to be 16.27 per cent while there is only 15.11 per cent of nitrogen in the black wool."

The low nitrogen percentage of the black wool is thought probably due to the presence of melanin, which has a lower nitrogen content than the keratin structure. The author has shown that the nitrogen of the melanin which appears in the humin fraction can only be a part of the true melanin nitrogen present in the wool. Apparently, hydrolysis with strong acids breaks down the melanin molecule. This observation is in agreement with previous work.

On the composition of tyrosinase from two enzymes, M. W. BEIJERINCK (*K. Akad. Wetensch. Amsterdam, Proc. Sect. Sci.*, 15 (1912-13), pt. 2, pp. 932-937).—When tyrosinase acts upon tyrosin a substance is obtained which is commonly called melanin. Its color may be jet black, or it may vary between light brown, pure red, brownish red, sepia, and black. The pigment is very stable, resisting heating with strong alkalis and sulphuric acid. Even when boiled with nitric acid, melanin remains almost unchanged.

Melanin is said to be the pigment present in the hair and hide of the higher animals. The theory is that tyrosin, when acted upon first, yields such products as homogentisic acid, ammonia, and carbon dioxide, and by another oxidation the homogentisic acid is converted into melanin.

In this work melanin formation was studied in a culture obtained by sowing garden soils on agar plates containing a medium composed of agar 2 per cent, tyrosin 0.1 per cent (dissolved in a few drops of sodium carbonate solution), and 0.02 per cent of potassium acid phosphate at 30° C. After 2 or 3 days numerous little colonies were formed which consisted of *Streptothrix* (*Actinomyces*). The common bacteria of the soil do not develop at all or only sparingly on the tyrosin plate and can not under the given conditions compete with the slowly growing *Actinomyces*. In some of the colonies a jet black spot was found, and near the center of the spot the *Actinomyces* was always present.

A more minute observation revealed the fact that the *Actinomyces* always lies under a thin glassy layer of fine rod bacteria. "This layer covers like a crust the jet black columns of *Actinomyces* and prevents them from producing spores, which does take place on that part of the mycelium which develops outside the bacterial cover. If from this layer the bacterium is brought into pure culture, which is easily done on broth-gelatin or broth-agar plates, it proves to be an extremely delicate polar ciliate rodlet, which forms no spores and strongly liquefies gelatin. Streaks of the pure culture on a tyrosin plate produce no melanin at all, and in this respect the bacterium resembles *Actinomyces*."

It is obvious from this that pigment formation results from the symbiosis of these organisms. This was proved by additional experiments. The 2 organisms produce no pigments on peptone or broth-containing media. Several other species of *Actinomyces* produce blue, red, or yellow pigments. "In this case it is not tyrosin but glucose, malates, and nitrates that form the chromogenous food, so that the symbiosis is then evidently associated with other factors than those active in the production of melanin from tyrosin."

Experiments made with the *Actinomyces* and the sodium salts of homogentisic acid gave no pigment, but when the other bacterium was present a brown

pigment was formed. The name suggested for the enzym particularly active is 'homogentisinase.'

Some experiments with tyrosinase obtained from the potato, beet root, and the latex of *Euphorbia lathyris* are also reported.

Oxidases of the female corn bloom, G. DOBY (*Math. és Term. Tud. Értésítő, Magyar Tud. Akad. [Budapest], 30 (1912), No. 2, pp. 324-339, figs. 2; abs. in Ztschr. Gesam. Getreidew., 4 (1912), No. 5, p. 139; Chem. Abs., 7 (1913), No. 1, p. 106*).—The fact that the female inflorescence turns brown after pollination is said to be due to the presence of a peroxidase and an oxygenase. Peroxidase is present only as a reserve enzym, acts in conjunction with the oxygenase, and probably hastens the withering of the organs of the flower when they become superfluous.

The microscopical examination of vegetable products as an adjunct to their chemical analysis, A. L. WINTON (*Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York], 18 (1912), Sect. VIIIc, p. 361-366; Amer. Jour. Pharm., 85 (1913), No. 3, p. 132-137*).—This discusses why it is necessary for the food and drug analyst to have a knowledge of botany, especially vegetable histology.

The colorimetric method for determining hydrocyanic acid in plants with special reference to Kafir corn, C. K. FRANCIS and W. B. CONNELL (*Jour. Amer. Chem. Soc., 35 (1913), No. 10, pp. 1624-1628*).—"This work on a method for the determination of hydrocyanic acid was prompted by the need for an accurate knowledge of the amount of hydrocyanic acid, or glucosids containing hydrocyanic acid, that might be found in Kafir corn, milo maize, Johnson grass, and other plants. In work done relative to the amounts of hydrocyanic acid in the saccharin and nonsaccharin sorghums, it appeared that there existed no satisfactory method for the estimation of the small percentages of hydrocyanic acid found in plants. These percentages may vary between 0.0018 and 0.03 per cent."

After reviewing critically the silver nitrate, ferro-ferricyanid, ammonium-alum, lead acetate, mercurous nitrate, and thiocyanate (colorimetric) methods, the last-named with some modifications was decided upon as the most suitable for this purpose. The procedure adopted was as follows:

"In order to render the hydrocyanic acid in the sorghum available, triturate 50 gm. of the finely chopped material with 100 cc. of water; wash into a 1-liter distilling flask with 100 cc. of water. Acidify with 50 cc. of concentrated sulphuric acid and distill about 150 cc. into 50 cc. of a 4 per cent solution of potassium hydroxid. Care should be taken that the end of the condenser dips into the potash solution at all times, or a loss of hydrocyanic acid may result. Make the potash solution to a volume of 250 cc. and use an aliquot equal to one-fifth of the entire solution. To this aliquot add 1 cc. of yellow ammonium sulphid and evaporate to dryness on a water bath. Take up with 10 to 15 cc. hot water and barely acidify with dilute hydrochloric acid. Filter through quantitative filter paper until free sulphur is removed. Add $\frac{1}{2}$ cc. dilute hydrochloric acid and boil 5 minutes. Filter to remove free sulphur; repeat the last operation of boiling and filtering until the solution is absolutely clear. Make up nearly to the mark in a 50-cc. Nessler tube and add 15 drops of 5 per cent ferric chlorid solution. The presence of cyanid in the sample is indicated by a bright cherry-red coloration. If too much acid is present the solution will be lemon-yellow. If alkaline, the iron will be precipitated, but this condition may be corrected by the addition of a few drops of acid. The exact quantity of potassium cyanid present is determined by matching the color with standards in a colorimeter. The standard solution is made to contain 15 gm. of

potassium thiocyanate in a liter of water. This is standardized gravimetrically with silver until 1 cc. equals 14.92 mg. of potassium sulphocyanid, which is equivalent to 10 mg. of potassium cyanid; 50 cc. of this solution is then diluted for use in the Nessler tubes. Thus 1 cc. of the diluted thiocyanate solution is equivalent to 1 mg. of potassium cyanid."

The method was checked up with potassium cyanid 99.6S per cent (Merck). The plants studied were taken from a field in which the poisoning of stock occurred and they contained a maximum amount of cyanogen. These plants were stunted and almost dry from the lack of water.

Assuming that the rumen of a cow has a capacity of 275 liters, which may correspond to a feed content of 200 kg., there would be about 5 gm. of hydrocyanic acid present in the stomach of this animal and this would be sufficient to kill it. "However, no cases are on record of a beef animal eating 200 kg. (nearly 450 lbs.) at one feeding. Besides, the rumen is not emptied at any time but remains in a well-fed animal at about the same weight, the undigestible matter being removed gradually."

Handbook of food analysis, edited by A. BEYTHIEN, C. HARTWICH, and M. KLIMMER (*Handbuch der Nahrungsmitteluntersuchung. Leipzig, 1914, vol. 1, pp. XXIV+1072, figs. 82*).—This volume, by A. Beythien, is the chemical-physical part of a handbook, of which two other volumes are to follow dealing respectively with botanical-microscopical and bacteriological and biological methods. It contains methods for the analysis of meats, soups, milk (including condensed milk), cheese, edible oils and fats, cereals and leguminous seeds, flour, farina, bread, pastry, yeast, vegetables and roots (fresh and conserved), fresh and preserved fruits, jellies, marmalades, fruit juices, fruit sirups, preservatives in fruit juices, honey, beeswax, alcohol-free beverages, sugar and sugar goods, alcoholic beverages (beer, wine, cordials), vinegar, spices, tea and coffee and coffee surrogates, cocoa and chocolate, water, air, miscellaneous materials used in the handling and canning of foods, dyestuffs, paper (cartons, etc.), textile fibers, woven goods, soap, washing compounds, cosmetics, petroleum, candles, matches, poisons, and urine.

In many cases the judgment of the commodity on the basis of the analysis is discussed.

Table of calculated dry substance in milk as determined by the Fleischmann formula, R. PFISTER and W. LEUZE (*Milchw. Zentbl., 42 (1913), Nos. 4, pp. 97-103; 5, pp. 134-138; 6, pp. 169-173; 7, pp. 196-200*).—This table gives the calculated dry substance in quantities of milk varying in specific gravity from 1.019 to 1.04 and in fat content from 0.1 to 6 per cent. The formula $t = 1.2 f + 2.665 \frac{(100 s - 100)}{s}$ is used, in which t represents the dry substance, f the fat content in per cent, and s the specific gravity at 15° C.

The volatile oils, E. GILDEMEISTER and F. HOFFMANN, trans. by E. KREMERS (*London, Bombay, and Calcutta, 1913, vol. 1, 2. ed., pp. XII+677, pls. 2, figs. 75*).—This is a translation of the second revised and enlarged German edition of the first volume of this work, which has been previously noted (*E. S. R.*, 25, p. 113). Its contents are as follows: Historical introduction; production of flower perfumes by extraction, enfleurage, and maceration; principal constituents of volatile oils, natural and artificial perfumes; and the chemical and physical examination of volatile oils.

On Japanese peppermint oil, Y. SHINOSAKI (*Jour. Indus. and Engin. Chem., 5 (1913), No. 8, pp. 658-660*).—A study of peppermint oil produced at the Kitami branch of the agricultural experiment station of Hokkaido and the Odakogetsu Peppermint Oil Trade Association in the Okayama prefecture.

Peppermint oil industry in Japan, Y. SHINOSAKI (*Jour. Indus. and Engin. Chem.*, 5 (1913), No. 8, pp. 656-658, figs. 6).—A description, with illustrations, of a method for preparing peppermint oil in Japan. "The Japanese peppermint fields are chiefly located in Hokkaido, Okayama, and Hiroshima prefectures."

The maple sugar industry in Canada, J. B. SPENCER (*Canada Dept. Agr. Bul. 2B* (1913), pp. 64, figs. 32).—This is a well-illustrated bulletin dealing with the history and extent of the maple sugar industry in Canada. It describes the sugar-making plant, its operation, and the marketing of the sirup and by-products. The benefits to be obtained in forming cooperative maple sugar makers' associations and inaugurating maple sugar contests are pointed out.

The glucose and starch industry (*Thirteenth Census U. S.*, 10 (1910), pp. 429-434).—An account of the extent of the starch and glucose industry in 1909.

Manufacture of sugar from wood, A. ZIMMERMANN (*Jour. Roy. Soc. Arts [London]*, 61 (1912), No. 3133, pp. 69-81; *abs. in Chem. Ztg.*, 37 (1913), No. 48, p. 490).—Wood flour when treated in closed retorts with a weak solution of sulphurous acid under a pressure of 6 to 7 atmospheres is decomposed. The resulting products contain about 25 per cent (of the wood used) of sugar and 5 per cent of volatile substances which consist of acetic acid, furfural, and formaldehyde. The sugar is sold under the name of Bastol and is utilized for the feeding of animals.

The action of ozone upon cellulose.—Its action upon beech wood (lignocellulose), C. DORÉE and MARY CUNNINGHAM (*Jour. Chem. Soc. [London]*, 103 (1913), No. 606, pp. 677-686; *abs. in Chem. Ztg.*, 37 (1913), No. 73, p. 738).—In the presence of moisture ozone acted very rapidly upon woody substances and caused an evolution of carbon dioxid and acid substances. Much of the wood was converted into water-soluble derivatives and after 12 hours there was a loss corresponding to 40 per cent in its weight. The water-soluble substances consisted of acetic, formic, and other reducing acids. Furfural was also noted.

Utilizing wood waste, J. E. TEEPLE (*Jour. Indus. and Engin. Chem.*, 5 (1913), No. 8, pp. 680-685).—This deals with the utilization of wood waste for preparing paper pulp, ethyl alcohol, acetate of lime, wood alcohol, charcoal, turpentine, pine oil, rosin, tar, tar oils, creosote oils, pitch, light oils, wood oils, gas, cattle feeds, acetic acid and acetone, camphor, rosin oils, wood preservatives and paints, disinfectants, sheep dip, perfumes, liniments, and embalming fluid and specialties. The various processes are briefly considered.

Chemistry in relation to the frozen meat industry of New Zealand, A. M. WRIGHT (*Jour. Indus. and Engin. Chem.*, 5 (1913), No. 8, pp. 673, 674).—This deals especially with the utilization and shipment of the by-products of the beef industry and the chemical control of this industry. The products considered are frozen meats, oleomargarine, casings, tankage and blood, wool and pelts, preserved meats, and meat extract.

Butchers', packers', and sausage makers' red book (*Chicago, Montreal, and Sydney, 1913*, pp. 129).—This book contains numerous recipes for preparing meat goods such as hams, bacon, sausages, Bologna, etc. The processes are described in detail.

About the occurrence of *Zygosaccharomyces* varieties in wine, MATSUMOTO and KROEMER (*Landw. Jahrb.*, 45 (1913), *Ergänzungs.* 1, pp. 106, 107).—Various kinds of *Zygosaccharomyces* have been noted in other media but rarely in wine. The results of this investigation show that they often occur in wine and under certain conditions of propagation the organism seems to resemble *Debaryomyces globosus*.

Investigations in regard to the occurrence of yeasts belonging to the *Saccharomycodes* in musts which have been oversulphured, KROEMER and HEINRICH (*Landw. Jahrb.*, 45 (1913), *Ergänzungs.* 1, pp. 105, 106).—Unpasteurized must which was hypersulphured was found to contain a species of *Saccharomycodes* instead of the usual wine yeast. The species found did not resemble in all respects *S. ludwigii*.

In regard to the place in the system occupied by *Saccharomyces apiculatus* forms which occur in fruit and grape wines, HEINRICH (*Landw. Jahrb.*, 45 (1913), *Ergänzungs.* 1, pp. 107, 108).—The lemon-shaped yeast occurring in wines could be placed in two classes, i. e., one producing a sausage-shaped cell when grown in must, in some cases being attached to one another and then having a mycelium-like appearance, and the other the typical lemon-shaped form.

The investigations are to be continued.

Report in regard to the activities of the pure yeast culture station, R. LAUE (*Landw. Jahrb.*, 45 (1913), *Ergänzungs.* 1, pp. 168–177).—This deals with the activities of the station in conjunction with wine manufacturers with reference to the fermentation of fruit, berry, and grape musts, the use of pure yeast for secondary fermentations in wine and for the preparation of foaming wines, examination and treatment of diseased wines, and the cultivation and multiplication of pure yeast, and other fermentation organisms.

The work done within the station included comparative fermentation tests with newly isolated pure yeasts and a study of the influence of musts of various sugar contents upon the formation of volatile acids by *Saccharomyces apiculatus*.

The fermentation of cacao, edited by H. H. SMITH (*London*, 1913, pp. LIV + 318, figs. 35).—This is a collection of essays submitted by A. Preyer, O. Loew, Fickendey, A. Schulte im Hofe, J. Sack, G. S. Hudson, and L. Nicholls in competition for the prize offered by *Tropical Life*. The fermentation of coffee and tobacco is also considered. The data deal almost entirely with the functions of the fermentation process.

Cacao, J. PEIMBERT Y MANTEROLA (*Estac. Agr. Cent. [Mexico] Bol.* 76 (1913), pp. 26, figs. 2).—This deals with the processes of preparing and fermenting cacao on the island of Saint Thomas in Portuguese northwestern Africa.

Calcium thioarsenate as a spray, S. H. KATZ and P. D. BUCKMINSTER (*Jour. Indus. and Engin. Chem.*, 5 (1913), No. 8, pp. 663, 664).—"Calcium thioarsenate is a soluble arsenical compound that is comparatively inexpensive and that has strong fungicidal properties. It can not be used in effective densities for spraying apple trees because of the injury it causes to the foliage. For the spraying of plants less sensitive to arsenic than the apple tree it may be found advantageous."

[Activities of the various state laboratories in Belgium] (*Min. Agr. et Trav. Pub. [Belgium], Off. Rural Raps. et Communs.*, No. 7 (1913), pp. 87–97).—This gives a tabulated statement of the analytical work performed by various laboratories in Belgium. The samples reported upon include fertilizers, feeds and feed cakes, fats, milk, pepper, salt, sugar, wine, and vinegar.

METEOROLOGY—WATER.

Weather forecasting, R. M. DEELEY (*Nature [London]*, 92 (1914), No. 2309, pp. 608, 609).—In this article it is maintained that to be of real service to agriculture correct forecasts should be published for at least seven days in advance, and in view of the importance of such forecasts and of the agricultural interests that would be served a strong plea is made for increased appropriations for the necessary meteorological observations and investigations.

Weather forecasting, W. H. DINES (*Nature* [London], 92 (1914), No. 2311, pp. 659, 660).—The importance and possibility of ultimately securing accurate seasonal forecasts are discussed. The need for this purpose of further study of the causes of cyclones and anticyclones is pointed out.

Bulletin of the Mount Weather Observatory (*U. S. Dept. Agr., Bul. Mount Weather Observ.*, 6 (1914), pts. 3, pp. 61-103, figs. 13; 4, pp. 107-194, figs. 33).—These numbers contain the following articles: No. 3.—The Zodiacal Light (illus.), by M. Hall; Does the Zodiacal Light Come from Any Part of the Earth's Atmosphere? by C. Abbe; and Free Air Data at Mount Weather for April, May, June, 1913 (illus.), by W. R. Blair.

No. 4.—Observations on the Increase of Insolation with Elevation, by H. H. Kimball, and Summary of the Free-Air Data Obtained at Mount Weather for the Five Years, July 1, 1907, to June 30, 1912 (illus.), by W. R. Blair.

Monthly Weather Review (*Mo. Weather Rev.*, 41 (1913), Nos. 11, pp. 1639-1797, pls. 9, figs. 6; 12, pp. 1799-1952, pls. 10).—In addition to the usual climatological summaries, lake levels, weather forecasts and warnings for November and December, 1913, river and flood observations, lists of additions to the Weather Bureau library and of recent papers on meteorology, a condensed climatological summary, and climatological tables and charts, these numbers contain the following special papers:

No. 11.—Heavy Snowstorm in Ohio, West Virginia, and Southwestern Pennsylvania; Storm of November 7-10 (on the Great Lakes), by J. H. Armington; Notes on the Rivers of the Sacramento and San Joaquin Valleys, by N. R. Taylor; Notes on Streams and Weather of the Upper San Joaquin Watershed, by W. E. Bonnett; and Variations in Rainfall in California (illus.), by W. G. Reed.

No. 12.—Climatic Summary for the Year 1913 (South Atlantic and East Gulf States), by C. F. von Herrmann; Climatic Summary for the Year 1913 (Lake Region), by H. J. Cox; Notes on the Rivers of the Sacramento and Lower San Joaquin Watersheds during the Month of December, 1913, by N. R. Taylor; Notes on Streams of the Upper San Joaquin Watershed, by W. E. Bonnett; and Notice of Change in the Publication of Climatological Data.

Meteorological observations at the Massachusetts Agricultural Experiment Station, J. E. OSTRANDER and E. K. DEXTER (*Massachusetts Sta. Met. Buls.* 301, 302, pp. 4 each).—Summaries of observations at Amherst, Mass., on pressure, temperature, humidity, precipitation, wind, sunshine, cloudiness, and casual phenomena during January and February, 1914. The data are briefly discussed in general notes on the weather of each month.

Evaporation from free water surfaces, LUEDECKE (*Kulturtechniker*, 17 (1914), No. 1, pp. 53-57, figs. 7).—The author briefly discusses the accuracy of measurements of evaporation from free water surfaces and shows the differences in the results obtained by several observers.

A plea for the exact measurement of rainfall, F. FLOWERS (*So. African Jour. Sci.*, 10 (1913), No. 4, pp. 81-86, fig. 1).—It is maintained in this article that the ordinary rain gages do not give the complete information required in regions of torrential rainfall. The use of automatic gages is recommended.

The fight against hail, AUDIFFRED ET AL. (*Bul. Soc. Nat. Agr. France*, 74 (1914), No. 1, pp. 64-91).—This is a review of methods used and results obtained in different districts of France in efforts to afford protection against hail by artificial means, particularly with the so-called "electric niagaras."

Water storage and its advantages, A. C. HOUSTON (*Jour. Path. and Bact.*, 18 (1914), No. 3, pp. 351-364).—The author, by a series of experiments, defends his views regarding the value of storage for reducing the bacterial content of water supplies, as attacked by Coplans, who maintains that in the absence of

disruption by mechanical measures the processes of agglutination and subsequent sedimentation account for the negative bacterial content of water stored in glass vessels at laboratory temperature.

The importance of the quantitative determination of chlorids in the examination and judgment of drinking water, F. MALMÉJAC (*Compt. Rend. Acad. Sci. [Paris]*, 158 (1914), No. 9, pp. 650-652; *abs. in Rev. Sci. [Paris]*, 52 (1914), I, No. 11, p. 348).—The author maintains that any notable increase in the chlorin content of a drinking water is an indication of contamination. The determination of chlorin, therefore, furnishes a simple means of detecting possible contamination. The indication of contamination afforded by a marked increase of chlorin should, however, be confirmed by complete analysis.

The taste of hard water, A. FRIEDMANN (*Ztschr. Hyg. u. Infektionskrankh.*, 77 (1914), No. 1, pp. 125-142).—Experiments are reported which show that the presence of carbon dioxide, even in very small amounts, imparts a distinct taste to water and that this furnishes a means of rough classification of waters with reference to hardness.

A list of references to articles bearing on this subject is given.

The influence of waste liquors from potassium chlorid factories on the biological purification of water supplies, A. MÜLLER and L. R. PRESENIUS (*Arb. K. Gsndhtsamt.*, 45 (1913), No. 4, pp. 491-521, fig. 1).—It was found that 3,000 parts of chlorin per million of the raw water did not injure the biological properties of the water for domestic and industrial purposes, but that 6,000 parts per million and over caused a marked injury. Oversalting with waste liquors retarded and, in some cases, prevented putrefaction. The increased specific gravity of the oversalted water hindered sedimentation.

SOILS—FERTILIZERS.

Humus in California soils, R. H. LOUGHRIDGE (*California Sta. Bul.* 242 (1914), pp. 49-92).—This bulletin discusses the nature and value of humus as a soil constituent and presents in detail results of a systematic study of the distribution and composition of humus in each agricultural district of California.

It was found that humus was distributed in California soils to a depth of 12 ft. or more. On account of this wide distribution the percentage is smaller although the total amount is larger than in soils of humid regions. In the first 3 ft., which is considered the soil proper, the California soils contain more humus than soils of humid regions, and the amount in the soils to a depth of 12 ft. is more than double that found in humid soils. The surface soils of California contain on an average 1.28 per cent of humus. The upper 3 ft. of soil proper show an average of 1.06 per cent of humus per foot. The tule swamps have the highest percentage of humus; the deserts the least. The amount of humus is less in close, compact adobe clays than in lighter loam and sandy soils. The soils of the Coast Range valleys in the western part of the State have a higher percentage of humus than those of any other agricultural region of the State, probably because of the greater humidity and denser vegetation of that region.

Attention is called to the fact that the black color of the soil is not always due to a high humus content, since many black soils examined showed a smaller percentage of humus than soils of a gray color, and some contained no humus at all. The humus content was sometimes less in the first foot than in the second as a result of the destruction of organic matter by cultivation and summer fallowing.

The average proportion of nitrogen in the humus of the first foot of the soils was found to be 5.92 per cent; that of each of the upper 3 ft., 5.6 per cent, and somewhat less for the entire 12 ft. It varied from 1 to 20 per cent in individual soil layers.

The organic nitrogen in the soil derived from the humus and dependent upon the amount of the latter varied from almost nothing in the lower depths of the soil to as much as 0.13 per cent in the upper 3 ft., in upland soils. The average for the first foot of the soil was 0.07 per cent; for each of the upper 3 ft. it was 0.05 per cent.

Wide distribution of humus and nitrogen in California soils tends to extend the feeding area of roots of plants and thus increase their power of resistance to drought.

The humus of acid and alkaline peats, J. A. HANLEY (*Jour. Agr. Sci. [England]*, 6 (1914), No. 1, pp. 63-76; *abs. in Jour. Soc. Chem. Indus.*, 33 (1914), No. 4, p. 210).—Experiments with a number of acid, neutral, and alkaline peats to determine a safe method for distinguishing chemically between the different classes as regards acidity and alkalinity are reported.

Preliminary tests of 35 peats led to the conclusions (1) that in every soil containing an appreciable quantity of organic matter, part of the humus is soluble in ammonia without previous acid treatment, (2) that soils containing no calcium carbonate give an acid reaction to litmus and vice versa. More detailed studies of the humus of five different typical peats gave the following results: Ammonia apparently dissolved out substances of very nearly the same nitrogen content whether or not the peat was previously treated with acid, and the composition of the humus as regards nitrogen varied only slightly in different peats. Caustic soda gave lower and more significant results than ammonia in all cases, indicating that the soda dissolves "either different compounds or different kinds of the same compounds." An estimation of the nitrogen formed by hydrolysis of proteins and similar compounds in the five peats showed that only the alkaline peats yielded ammonia and this in small amounts.

Tests of the sucrose-inverting powers of the peats showed that this power varied considerably with the different peats and in every case the inversion was greater after acid treatment than before. Further tests of the sucrose-inverting powers of soils led to the conclusion that "the acidity of a soil does not depend on the actual proportion of the acid in the soil . . . [but] on the state of the organic matter in the soil and the proportion of it which is in an acid state. . . . In estimating acidities, then, it is necessary to know not only the proportion of humus in an acid state to the total soil but the proportion of 'humus' as 'humic acid' to 'humus' as 'humates,' and this involves a determination of sugar inverted after treatment with dilute acid."

It is concluded in general that it is never safe to judge the acidity of a soil from the percentage of it directly soluble in alkalis. It appears as though some less general property of acids than solubility in alkalis must be used, in which neutral compounds can not take part, such as inversion of sucrose.

Contribution to the knowledge of typical kinds of peat, H. MINNSEN (*Landw. Jahrb.*, 44 (1913), No. 1-2, pp. 269-330; *abs. in Zentbl. Agr. Chem.*, 42 (1913), No. 12, pp. 796-799).—Studies of numerous samples of peat typical of the high, intermediate, and low moors of Germany as regards their physical and chemical composition, plant and animal origin, heat of combustion, and the determination of quantities of extract using alcohol, ether, and petroleum ether as solvents are reported.

Ash analyses showed a low mineral content of the forest peats and a relatively high mineral content of the muck formations. The lime content of the major-

ity of the high moor peat types was low and that of the low moor types generally high. The lime-magnesia ratio in all the types varied between wide limits and approached unity only in peat very poor in lime. Easily soluble alkalis were present only in very small amounts in any of the types while the iron oxid content was generally high. In peats with a high ash content inorganic sulphur compounds were found while organic sulphur was present in peats having a low ash content. Phosphoric acid was seldom found in noteworthy amounts.

The peat-forming plants investigated were rich in potash and phosphoric acid but had a very variable lime content. Extraction by solvents was best effected when using the peat in fine dust form intermixed with clean sand. Alcohol generally produced the largest amounts of extract and petroleum ether the least, and a so-called pollen muck peat yielded the greatest extract of all the peat types. The bleached moss peat extract increased with the age and decomposition of the peat, being greatest with petroleum ether and least with alcohol as the solvent.

The heat of combustion of the peat types generally decreased with increased ash content and varied according to botanical composition, condition of decomposition, and the content of alcohol soluble matter.

The products of distillation from the different peat types and muck formations depended upon the lime and nitrogen content, as all peats poor in lime and nitrogen gave acid distillates while those rich in lime and nitrogen gave alkaline distillates.

The nature and amount of the fluctuation in nitrate contents of arable soils, E. J. RUSSELL (*Jour. Agr. Sci. [England]*, 6 (1914), No. 1, pp. 18-57, figs. 2; *abs. in Jour. Soc. Chem. Indus.*, 33 (1914), No. 4, p. 210).—In extended studies of the nitrate content of arable soils, it was found that in sand, loam, and clay soils this fluctuated regularly, but rarely exceeded 6, 23, and 14 parts per million respectively in the soils except when they were heavily manured, when it sometimes rose to 37 parts. In most of the soils tested the accumulation of nitrate took place most rapidly in late spring or early summer, after which there was usually little if any gain and frequently a loss, except in the hot, dry summer of 1911 when the accumulation continued in some of the soils until September. Losses of nitrate occurred during the winter and were more marked during a wet than during a dry winter.

The fluctuations in nitrate content were more marked on loams than on clays or sands. Clays lost less of their nitrates in winter but accumulated smaller amounts in June and July. Sands lost much of their nitrates in winter and did not accumulate very large amounts in summer. "It appears that the main loss in winter is due to leaching and not to denitrification." A comparison of nitrate contents of cropped and fallow land showed that during late summer and early autumn the fallow land was the richer even after adding the nitrate taken up by the crop. No evidence was found that nitrate was produced in the soil during the time of active crop growth, although nitrate accumulation was taking place on adjacent fallow land. "The rapid rise in nitrate content in spring does not usually set in immediately the warm weather begins; there is a longer or shorter lag. There are indications of greater bacterial activity in early summer than later on." It is concluded "that the factors which determine the accumulation of nitrates in the soil also play a great part in determining the amount of crop production. Thus heavy winter rainfall, which washes out nitrates, tends to reduce crop growth; on the other hand hot dry summers succeeded by dry winters are favorable to nitrate accumulation and therefore to crop growth."

Influence of soils and their water contents on nitrogen transformation, F. MÜNTER and W. P. ROBSON (*Centbl. Bakt. [etc.]*, 2. Abt., 39 (1913), No. 15-17, pp. 419-440; *abs. in Internat. Inst. Agr. [Rome]*, *Mo. Bul. Agr. Intel. and Plant Diseases*, 5 (1914), No. 2, pp. 192-194; *Jour. Chem. Soc. [London]*, 106 (1914), No. 616, I, p. 244).—Investigations are reported on the effect of variable water contents and the addition of organic substances on the transformation of organic and inorganic nitrogenous fertilizers in sand, clay, and loam soils.

Horn meal decomposed more rapidly in dry sand soil than in clay or loam, while with higher water contents there was little difference. Ammonium sulphate transformation and nitrate formation increased with a higher water content in all of the soils. This was more rapid in clay and loam than in sand when wet. With dry soils the reverse was true. Horn meal ammonia disappeared rapidly in all of the soils when wet but was retained longer in dry soil, reaching its maximum amount more rapidly the lighter the soil. The fixed absorption of ammonia salts was greater the heavier the soil. The best nitrate formation from horn meal in all cases occurred in the sand soils and was best in clay and loam, with a medium water content. Ammonium sulphate yielded greater quantities of nitrates and more available plant food than horn meal with two exceptions. In general, the largest nitrate formation occurred between the third and sixth weeks except in wet clay. A high water content caused a marked loss of nitrogen from ammonium sulphate in loam and especially from horn meal in clay and loam.

A liberal addition of sugar so decreased the soluble nitrogen compounds as to cause a deficiency in nitrogen for crops, and caused an increase in nitrate assimilation in all of the soils and a loss of gaseous nitrogen from the sand and loam soils.

Ammonium sulphate decomposed more rapidly in all of the soils when sugar was added, but there was no corresponding increase in nitrate formation.

Effect of CS_2 and toluol upon nitrification, P. L. GAINES (*Centbl. Bakt. [etc.]*, 2. Abt., 39 (1914), No. 23-25, pp. 584-595, figs. 2; *abs. in Jour. Chem. Soc. [London]*, 106 (1914), No. 616, I, p. 236).—A previous article on this subject by the same author has already been noted (*E. S. R.*, 30, p. 219). The results of the investigations by the author and other investigators are summarized as follows:

"The detrimental or beneficial effect of toluol or CS_2 upon nitrate accumulation in soils depends (a) upon acting strength of the chemical in question; and (b) upon whether the soil is exposed for the chemical to evaporate.

"Toluol, in strengths approximating 0.1 cc. per 100 gm. soil, exerts no appreciable effect upon nitrification. If the strength exceeds this it may, and usually does, exert a detrimental or even inhibitory effect upon the process for short periods of incubation. However, if the periods of incubation are extended this harmful effect, which may last as long as 150 days, is overcome with strengths up to and including 1 cc. per 100 gm. soil, the strongest tested.

"In strengths of less than approximately 1 cc. per 100 gm. soil CS_2 , even for short periods of incubation, does not exert an appreciable effect upon nitrate accumulation. If the strength exceeds approximately 1 cc. per 100 gm. soil, CS_2 may, and usually does, exert a temporary retarding effect which, however, is soon overcome even with as strong a treatment as 5 cc. per 100 gm. soil.

"Samples of soil treated with either chemical in sufficient quantity to entirely inhibit nitrification for a period of 4 to 20 weeks may entirely recover from the effect without reinoculation.

"So far as the results thus far reported from laboratory experimentation can be applied to experimental field practice, it would seem that neither toluol

or CS₂, as previously used, could materially effect nitrate accumulation since practical applications rarely ever exceed approximately 0.1 cc. per 100 gm. soil."

A short bibliography of the subject is given.

The mechanism of denitrification, W. HULME (*Abs. in Proc. Chem. Soc. London*, 29 (1913), No. 420, pp. 307, 308; *Jour. Soc. Chem. Indus.*, 32 (1913), No. 24, p. 1165).—"A series of experiments, conducted with a view to investigate the mechanism of denitrification, showed that this reduction might be divided into two parts, namely, (1) the bacterial reduction, and (2) the enzymatic reduction.

"The fermentation of similar media, one with and the other without potassium nitrate, under anaerobic conditions, showed the gas evolution to consist of nitrogen (98 per cent) and carbon dioxide from the nitrate-containing medium, and of hydrogen (70 per cent) and carbon dioxide from the nitrate-free medium. A medium containing only a very small percentage of nitrate evolved nitrogen and carbon dioxide as long as nitrate and nitrite obtained in the solution, but hydrogen and carbon dioxide appeared as soon as these had disappeared; thus the chemical agent by which the organism reduces the nitrate is nascent hydrogen.

"The media were tested for enzyme action by precipitation with alcohol, drying, dissolving in water, and Chamberland filtration, measured quantities of this solution being added to small quantities of a sterilized 1 per cent solution of potassium nitrate, and the nitrite produced being measured. The results showed a considerable reduction with the 'product' obtained from the nitrate-containing flasks, while that obtained from the nitrate-free flasks was devoid of this reducing power.

"These results were confirmed by a second series of experiments, in which the fermentation took place aerobically. The enzyme solutions in all cases were not affected by boiling."

Equations illustrating the mechanism of denitrification are presented, showing the formation of carbon dioxide by the action of bacteria and of nitrogen by the action of enzymes.

The action of soil bacteria and their relation to condition of the soil and plant growth, H. FISCHER (*Gartenflora*, 63 (1914), No. 2, pp. 33-46).—This article touches briefly on the different activities of soil bacteria in the decomposition and transformation of fertilizing matter into available plant food, taking up particularly the processes of nitrate and carbon dioxide formation, nitrogen losses, nitrogen assimilation, and other related subjects.

Nodule bacteria and preparations for soil inoculation, I. A. MAKINOV (*Zhur. Opytn. Agron. (Russ. Jour. Expt. Landw.)*, 14 (1913), No. 6, pp. 341-367, figs. 11).—Examinations and comparative tests were made of several commercial preparations and of crushed nodules for the inoculation of leguminous plants. The commercial preparations were found to be contaminated with other organisms and contained comparatively limited numbers of *Bacillus radicicola*. They were, however, as a rule more effective in promoting growth than the water extracts of the crushed fresh nodules.

Colloidal matter in clay and soils, P. ROHLAND (*Internat. Mitt. Bodenk.*, 3 (1913), No. 6, pp. 487-493).—The nature, properties, and functions of colloids in soils and their importance in agriculture are briefly discussed along the same line as in previous articles (E. S. R., 22, p. 712; 29, p. 817).

The solution and precipitation of iron in the formation of iron pan, C. G. T. MORISON and D. B. SOTHERS (*Jour. Agr. Sci. [England]*, 6 (1914), No. 1, pp. 84-96; *abs. in Jour. Soc. Chem. Indus.*, 33 (1914), No. 4, p. 210).—

Investigations on the solution and precipitation of iron in the formation of iron pan or ortstein are reported. The occurrence of iron pan is described and several theories on the subject are briefly reviewed, the authors agreeing with the theory of Müns^a that the formation of iron pan is due to the formation of colloidal humus compounds of iron and aluminum which are precipitated in the soil depths by soluble salts, loss of water, or by change of bases.

Experiments mainly concerned with investigations of the properties of various so-called humates and with attempts to dissolve iron either as ferrous humate or as ferrous bicarbonate under approximately natural conditions led to the following conclusions: (1) Peat is a strong reducing agent but is not capable of reducing ferric oxid to ferrous oxid; (2) the solution obtained by the action of peat on ferric oxid does not contain ferrous humate, which appears to be accompanied by the presence of ferrous ions; (3) peat in the presence of water removes considerable quantities of minerals, especially ferric oxid, aluminum, and calcium oxid, from the soil as colloidal suspensions, which do not seem very sensitive to changes in concentration, although their capacity for suspension is to a certain extent destroyed by evaporation to dryness; (4) in the case of iron the compound formed is probably ferric humate, but possibly an absorption complex of colloidal humus and colloidal ferric hydroxid.

The authors suggest that "the most probable course of events" in the formation of the pan is as follows: Acid substances are produced as the first results of the accumulation of the surface layers of peat, and they remove the more readily attacked soil constituents probably in the state of true solution. At the same time colloidal humates of iron, aluminum, and calcium are formed, probably as gels on account of the comparatively high concentration of the soil solution. As the concentration diminishes during the winter seasons, the gels pass into the sol form which, as the soil dries, follow the receding water table and the colloidal suspensions are deposited by rapid desiccation at a level just above the permanent water table.

A bibliography is appended.

Ferrous iron in soils, C. G. T. MORISON and H. C. DOYNE (*Jour. Agr. Sci. [England]*, 6 (1914), No. 1, pp. 97-101; *abs. in Jour. Soc. Chem. Indus.*, 33 (1914), No. 4, p. 210).—Experiments in which 10 gm. of each of four different soils were digested in dilute sulphuric acid and titrated with potassium permanganate, apparently showed large amounts of ferrous iron, which the authors believe are indicated "not because of any large amount really present in the soil, but because the ferric iron which is dissolved by the acid is partially reduced by the organic matter present."

Similar experiments, using clay to which varying quantities of acid peat were added, showed like results. The use of acetic acid as a solvent was found to be unsatisfactory, and it is concluded from these and other experiments that no known method is satisfactory for the determination of ferrous iron in soils, and that the existence of ferrous iron in normal soils to any extent, and of ferric iron in normal soil solution, seems improbable.

Mineral deposits, W. LINDGREN (*New York and London, 1913*, pp. XV+883, figs. 257).—Referring to the fact that "mineral deposits are usually classified and described by the metals or the substances which they contain . . . with little or no effort to separate them into genetic groups" the author states that "this book is the outcome of a desire to place the knowledge of mineral deposits on the broader and more comprehensive basis of a consistent genetic classification. . . . The general plan has been to select a few suitable examples to illustrate each genetic group of deposits."

^a Zentbl. Agr. Chem., 41 (1912), No. 1, pp. 3-10.

Among the agencies involved in the formation of mineral deposits prominent consideration is given to discussion of the flow, composition, and chemical work of underground waters. Among the examples of greatest agricultural interest selected to illustrate the various genetic groups are the nitrate, potash, and phosphate deposits.

Disposal of manure, P. M. HALL (*Amer. Jour. Pub. Health*, 4 (1914), No. 1, pp. 38-42).—This article briefly describes the methods of disposal employed in various cities of the United States and Canada, with special reference to sanitation. It is shown that these methods are generally inefficient from the standpoint of sanitation and wasteful from the standpoint of use of manure for fertilizing purposes.

The production of guano in Chile, G. YUNGE (*Abs. in Internat. Inst. Agr. [Rome]*, *Mo. Bul. Agr. Intel. and Plant Diseases*, 4 (1913), No. 12, pp. 1848-1850).—The total output of guano in Chile from 1844 to 1909 is stated to have been 229,902 tons. The output in 1910, principally from Punta de Lobos, was 12,483 tons, all used in Chile, as export is now prohibited.

Fertilizer economy in Holland, D. P. DE YOUNG (*Daily Cons. and Trade Rpts. [U. S.]*, 17 (1914), No. 34, p. 543).—It is shown that manure and commercial fertilizers are freely used in Holland. Often as much as \$20 to \$30 worth of fertilizer is applied per acre annually. Cattle manure sometimes sells for as much as 25 cts. per wheelbarrow load and is, therefore, carefully saved and used.

Rotation of crops is practiced to some extent but fertilizers are generally deemed sufficient to maintain the fertility of the soil. Deep and thorough tillage is universally practiced. Lime is freely used. In some cases a mixture of 30 cwt. of superphosphate, 20 cwt. of kainit, and 6 cwt. of nitrate of soda is used per acre. Such liberal applications of commercial fertilizers are generally used only where cattle manure is not available.

Production and import of fertilizers in Russia (*Chamber Com. Jour. [London]*, 33 (1914), No. 238, pp. 53, 54).—The statistics of production and import quoted show that there has been a considerable development of the fertilizer industry in Russia in recent years.

The production of superphosphate in 1912 was 135,000 tons. The importation was 206,856 tons, making the total consumption over three times that in 1908. The importation of Thomas slag was 186,246 tons and the production 36,000 tons. The imports of Chilean sodium nitrate was 56,736 tons, the proportion used for fertilizing purposes being unknown but probably one-half. The imports of potash salts amounted to 97,938 tons. There were also small importations of other miscellaneous fertilizer materials.

Recent statistics for the home production of mineral phosphates are not complete, but it is estimated that this was 18,473 tons in 1910.

Commercial fertilizers, 1912 (*Off. Rpt. Sec. Ohio Bd. Agr. on Com. Ferts.*, 1912, pp. 235).—Analyses and valuations of fertilizers licensed for sale in Ohio during the year are reported, with general comments on the results and a series of special popular articles relating to fertilizers as follows: Twelve Important Facts a Farmer Should Know When Purchasing Fertilizers, by H. G. Bell; Important Questions and Answers Relative to the Use of Manures and Fertilizers, The Home-Mixing of Fertilizers, Field Experiments with Fertilizers, Raw Phosphate Rock as a Fertilizer, The Nitrogen of the Fertilizer Sack, What is Lime, and Soil Analysis not a Sufficient Guide to the Use of Fertilizers, by C. E. Thorne; Fertilizing Problems, by A. Vivian; Analysis of Commercial Fertilizers, Use of Fertilizers, and The Phosphoric Acid in Phosphate Slag, by N. W. Lord; and Ammonia or Nitrogen, Filler or Make-Weight Materials, and Potash, by E. E. Somermeier.

Progress in the fixation of nitrogen in Scandinavia (*Jour. Indus. and Engin. Chem.*, 6 (1914), No. 2, pp. 163, 164).—This is a brief note on the successful commercial development of the process for oxidizing ammonia to nitric acid by means of the catalytic action of platinum as proposed by Ostwald. Reference is made to works at Odda and Aura, Norway, and to proposed factories in England, Scotland, and Ireland.

Methods of making ammonium sulphate from the sulphur and ammonia in coal gas, M. DESMARETS (*Rev. Gén. Chim.*, 16 (1913), No. 24, pp. 405-411, figs. 3).—The methods of Feld, Burkheiser, and others are described and their industrial value compared.

The organic synthesis of ammonia, O. SERPEK (*Ztschr. Angew. Chem.*, 27 (1914), No. 8, Aufsatzteil, pp. 41-48).—Investigations bearing upon the development of processes for the purpose are reviewed and the industrial possibilities of such processes are discussed.

The industrial synthesis of nitric acid and ammonia, C. MATIGNON (*Chem. Trade Jour.*, 54 (1914), Nos. 1391, pp. 68-70; 1393, pp. 155, 156; 1394, pp. 179, 180).—A detailed description of the various processes utilized for the preparation of the above-named substances from atmospheric nitrogen. The production of cyanamid is also considered.

Effect of soluble humates on nitrogen fixation and plant growth, W. B. BOTTOMLEY (*Rpt. Brit. Assoc. Adv. Sci.*, 1913; *abs. in Jour. Soc. Chem. Indus.*, 32 (1913), No. 18, p. 919).—"The insoluble humic acid present in peat is converted into soluble humate by the action of certain aerobic soil bacteria and the treated peat, after sterilization, forms a suitable medium for nitrogen-fixing bacteria; it is inoculated with the latter and either applied directly to the soil or used for the preparation of a culture solution. The prepared peat not only increases the fixation of nitrogen by the soil but also has a favorable effect on plant growth. Considerably increased yields of radishes, lettuce, turnips, and potatoes have been obtained with it."

Ammonium humate as a source of nitrogen for plants, W. B. BOTTOMLEY (*Rpt. Brit. Assoc. Adv. Sci.*, 1913; *abs. in Jour. Soc. Chem. Indus.*, 32 (1913), No. 18, p. 920).—"Ammonium humate has been found capable of supplying the nitrogen need of plants if soluble phosphates and potassium salts be present; it promotes the general growth and has a remarkable effect on the root development of plants. It is prepared by extracting bacteria-treated peat (see preceding abstract) with water, precipitating humic acid from the solution by hydrochloric acid, and dissolving the washed precipitate in ammonia solution."

The bacterial treatment of peat, W. B. BOTTOMLEY (*Jour. Roy. Soc. Arts*, 62 (1914), No. 3199, pp. 373-380).—This is a more detailed account of the investigations briefly noted above, with a discussion of the paper in which attention is called particularly to the claim of the author that peat "humated" by chemical means did not show the stimulating effect of the "bacterized" peat; and his suggestion that since the effects noted can not be due to the small amounts of plant food supplied there must be something in the prepared peat, possibly similar to the accessory bodies in foods, "which has the effect of stimulating and promoting growth in an extraordinary manner." The method of preparing the "bacterized" peat is not disclosed.

The solubility of mineral phosphates in citric acid, G. S. ROBERTSON (*Jour. Soc. Chem. Indus.*, 33 (1914), No. 1, pp. 9-11).—A comparison is made of the solubility in 2 per cent citric acid of the phosphoric acid in basic slag, bone meal, Tunisian raw rock phosphate, and calcined Belgian rock phosphate, with the results obtained with these phosphates in field experiments with grass.

The rock phosphates, particularly the calcined Belgian phosphate, were somewhat more effective as fertilizers than the basic slag.

Submitting these phosphates to repeated extractions with 2 per cent citric acid, it was found that the phosphates were completely soluble in the acid if enough acid was used and the time of extraction sufficiently prolonged, although the ordinary treatment with citric acid showed the phosphoric acid of the rock phosphate to be much less available than that of basic slag. The author, therefore, concludes that the citric acid test is worthless as a means of judging the relative fertilizing value of phosphatic fertilizers.

Investigations on the action of certain soil constituents on monocalcium phosphate in sandy soils, A. G. DAVIS (*Amer. Fert.*, 40 (1914), No. 3, pp. 39-47, figs. 2).—To 300-gm. portions of carefully purified beach sand, were separately added 10-gm. portions each of alumina, ferric oxid, ferrous sulphate, kaolin, lime, and tricalcium phosphate, and to each mixture was added 10 cc. of a solution containing 0.0567 gm. of monocalcium phosphate per cubic centimeter. The mixtures were dried in an oven at 100° C. for 15 hours and then extracted with water.

The results show that of the substances tested alumina and calcium oxid showed the greatest fixing power for phosphoric acid, kaolin and tricalcium phosphate being less active in this respect, and ferric oxid least of all. The ferric oxid at first fixed the phosphoric acid to a considerable extent, but after a time appeared to liberate it gradually in soluble form.

The locking up of phosphate fertilizers in Java soils, A. C. DE JONGH (*Internat. Mitt. Bodenk.*, 4 (1914), No. 1, pp. 32-45).—Experiments with soluble and insoluble phosphates on various Java soils are reported, the results in general tending to confirm Hilgard's conclusions that if highly ferruginous soils are fertilized with soluble phosphates "the phosphoric acid is likely to be quickly withdrawn from useful action, so that any excess not promptly taken up by the crop is likely to become inert and useless; . . . that the phosphoric acid tends to combine with the oxids and hydroxids of the trivalent metals, especially with those of iron, the equivalent aluminic compounds showing the same tendency but to a smaller degree, and that this ferric phosphate is for all practical purposes insoluble and inaccessible to the crop."

The results, however, did not confirm Hilgard's conclusion "that on ferruginous soils rather difficultly soluble phosphates should be used, such as bone meal and Thomas slag, which are said to be more slowly if at all acted upon by ferric and aluminic hydrates," and tend to discredit Van Byler's conclusion "that the degree of usefulness of the fertilizer and the relative amount tied up in the soil is materially affected by the phosphate being either in a soluble or in an insoluble state," since the difference in the results obtained with soluble and insoluble phosphates was insignificant.

Notwithstanding the rapid and extensive fixation of soluble phosphates which took place in certain lateritic soils, it is not, in the author's opinion, to be inferred that moderate application of such phosphates "can not produce a beneficent effect on the crop and good economic results."

The general conclusion is that the fixation of phosphate fertilizers in soils is chiefly due to certain colloidal compounds of the soil.

Influence of "crumbing" of superphosphate and Thomas slag on their action as fertilizers, J. MIKULOWSKI-POMORSKI (*Ztschr. Landw. Versuchsw. Österr.*, 16 (1913), No. 11-12, pp. 1044-1055).—Superphosphate and Thomas slag which had been made "crumbly" by the addition of gypsum or agar-agar were compared with the same materials in fine-ground condition in pot experiments with oats.

The crumbly superphosphate (crumbs 2 mm. in diameter with gypsum and larger with agar) was never less effective than the fine-ground, and in certain cases was more effective. Depth of application had more effect than crumbing. On the other hand, crumbing of Thomas slag reduced the effectiveness of the phosphoric acid.

Accessory constituents of phosphatic slag, A. DEMOLON and G. BROUET (*Jour. Agr. Prat., n. ser., 27 (1914), No. 1, pp. 22, 23*).—Analyses are reported showing on the average about 4 to 5 per cent of manganese, a considerable proportion of which was soluble in 2 per cent citric and acetic acids. The magnesia content was variable but on the average about 10 per cent. The free lime varied from 8 to 10 per cent.

It is suggested that the fertilizing effect of slag may be due in part to the manganese and magnesia which are present to a large extent in available form.

A brief note on the phosphate deposits of Egypt, J. BALL (*Survey Dept. Egypt Paper 30 (1913), pp. 6, pl. 1*).—Phosphate deposits occurring in seven different localities in the deserts of Egypt in the sedimentary strata belonging to the uppermost part of the Cretaceous system are briefly described.

Phosphate deposits were discovered in Egypt in 1900, and their exploitation began in 1908. The output in 1912 was 69,958 tons, mainly from the Safâga and Sibaia districts.

Topography and geology of the phosphate district of Safâga, J. BALL (*Survey Dept. Egypt Paper 29 (1913), pp. 19, pls. 4, fig. 1*).—The topography and geology of this district, which contains the phosphate deposits which are at present of most importance commercially in Egypt, are fully described.

"The phosphatic series consists of laminated gray clays with beds of calcium phosphate and chert, lying below the Upper Cretaceous limestones and above the Nubian sandstone. The total thickness of the series is about 45 meters, of which clays occupy about three-fourths. The phosphate beds occur in the upper part of the series. There are three principal beds of phosphate. . . . The beds vary somewhat in thickness and composition from point to point. . . . The highest bed of the series, . . . which has an average thickness of about 1.8 meters and contains in places as much as 60 per cent of tricalcic phosphate, immediately underlies the Cretaceous limestone, which latter is sometimes marly at its base. Then follows about 5 meters of brown chert beds, with thin bands of hard siliceous phosphate and occasionally thin clay partings. Immediately below the chert comes [the second] phosphate bed, with a thickness of about 1.3 meters and 50 to 75 per cent of tricalcic phosphate. This is followed by some 9 meters of gray and brown laminated clays, separating it from [the third] phosphate bed, which averages about 2 meters in thickness and contains 20 to 45 per cent of tricalcic phosphate. Below [this] phosphate bed the gray and brown laminated clays extend down for some 25 meters to the Nubian sandstone.

"In general appearance the phosphate somewhat resembles an earthy looking limestone or calcareous grit. It is a friable rock of a pale brown color with white spots, made up largely of phosphatic grit with a fair sprinkling of broken up fish bones, coprolites, and teeth. Where it is weathered on exposed faces the phosphate is typically of a darker color than on a fresh fracture, and the harder coprolites in it stand out as black spots, giving it a characteristic speckled appearance, which, though difficult to describe, is readily recognized when once seen. . . . It is generally found that the more friable varieties are the richest, yielding over 70 per cent of calcium phosphate. The top of [the second] seam is frequently formed of a hard variety of the rock, called 'hard panel' by the miners, containing only some 50 per cent or so of phosphate; this

comparatively low-grade rock is not worth extraction, and is left in to form the roof of the workings. The specific gravity of the phosphate is about 2.5."

A study of the phosphate industry, PÉTRÉ (*Bul. Écon. Gouv. Gén. Madagascar*, 13 (1913), III, No. 3, pp. 325-328).—Reference is made to deposits in Madagascar containing from 43 to 50 per cent of calcium phosphate. Methods of testing the phosphates are described and the possible industrial and agricultural use of the deposits is discussed.

German Thomas meal for America, R. P. SKINNER (*Daily Cons. and Trade Rpts.* [U. S.], 17 (1914), No. 38, p. 598).—In 1912 the total export was 662,865 metric tons, to the United States 13,726 tons; during the first 10 months of 1913, 585,122 and 6,127 tons, respectively.

The potash works of Upper Alsace (*Separate from Jahresber. Indus. Gesell. Mülhausen*, 1912, pp. 93, pls. 14, figs. 12).—This report contains information regarding the discovery, geology and mineralogy, exploration (including methods and machinery used and data obtained in numerous borings) and exploitation of the deposits, the chemical and physical character of the natural salts and the methods of purifying them, and the use of the potash salts in industry and agriculture.

Proposed substitutes for Stassfurt potash salts, H. G. SÖDERBAUM (*Meddel. Centralanst. Försöksv. Jordbruksområdet*, No. 86 (1913), pp. 21).—A product prepared by fusing leptit with charcoal and iron filings in an electric oven at 1,800° C. was compared with potassium sulphate in pot experiments with barley on moor soil. Its fertilizing efficiency was 78 per cent of that of the sulphate. The fused product contained about 11 per cent of potash, combined with silicic acid. Of this potash the larger part was soluble in 20 per cent and about half in 2 per cent hydrochloric acid.

The fertilizing value of phonolite, P. WAGNER (*Deut. Landw. Presse*, 41 (1914), Nos. 4, pp. 42, 43; 5, pp. 51, 52).—Two forms of this material offered for sale in Germany were tested in a series of pot experiments, the results indicating that phonolite is of little or no value as a fertilizer.

On the composition of giant kelps, A. R. MERZ (*Jour. Indus. and Engin. Chem.*, 6 (1914), No. 1, pp. 19, 20).—A number of analyses of samples of the giant kelps of the Pacific coast is reported. These show, generally, a high percentage of potash (as much as 30 per cent in one case). It was found that the ash content was almost invariably larger in the leaves than in the stems of the same plant, and that the nitrogen content was almost invariably larger in the laminae than in the stipe of the same plant.

Liming of soils, L. FORSBERG (*Jordens Kalkning. Malmö, Sweden*, 1913, pp. 29, pls. 9).—This discusses the action of lime in the soil and methods for determining the soil requirements for lime. Experiments in liming cereals and mangels in sandy and clay soils showed a marked increase in yield from the plat to which lime was applied in 3,000 or 6,000 kg. applications either with or without commercial fertilizers in 3 different fields in Sweden, when these soils showed an acid or neutral reaction.

The gypsum and salt of Oklahoma, L. C. SNIDER (*Okla. Geol. Survey Bul.* 11 (1913), pp. VIII+214, pls. 3, figs. 67).—This report contains chapters on the origin, properties, and occurrence in Oklahoma of deposits of gypsum, the manufacture and use of gypsum products, and the salt resources of the State.

Geology of the salt and gypsum deposits of southwestern Virginia, G. W. STROSE (*Va. Geol. Survey Bul.* 8 (1913), pp. 51-73, figs. 5).—The geology of the salt and gypsum deposits occurring in Washington and Smyth counties, Va., and the development of the salt and gypsum industries in this region are discussed.

AGRICULTURAL BOTANY.

Life processes in resting portions of plants, I, H. MÜLLER-THURGAU and O. SCHNEIDER-ORELLI (*Flora, n. ser.*, 1 (1910), No. 3, pp. 309-372, figs. 3).—An account is given in considerable detail of studies carried out regarding the influence of warmth, etherization, wound stimulation, and enzymes on life processes in the potato and lily-of-the-valley as indicated by separation of carbon dioxid, etc. It is held that the suspension of growth during the resting period of plants and the appearance of the buds are not dependent directly on the amount of material present, but that these are affected largely by factors as yet but little known in this connection.

Life processes in resting portions of plants, II, H. MÜLLER-THURGAU and O. SCHNEIDER-ORELLI (*Flora, n. ser.*, 4 (1912), No. 4, pp. 387-446, figs. 6; abs. in *Bot. Centbl.*, 123 (1913), No. 2, p. 22).—The authors, reporting further investigations (see above) made with resting portions of lilac, lily-of-the-valley, horse chestnut, potato, flag, grape, and strawberry plants, state that increase of sugar following warm baths appeared to be not a direct effect thereof, but the result of an intermediate process thereby induced. Cold storage increased, but warm baths decreased the sugar content of the lily-of-the-valley and potato. In these plants warming increased respiration. Increase of reducing sugars also attended the close of the resting period. Wound stimulus was followed by a slight increase of sugar. In general it appears that metabolism is considerably affected by warming, at least toward the end of the resting period, this being apparently due to a stimulative action bringing about an unstable condition of the protoplasm as evidenced by heightened respiration.

Experiments on shortening the vegetative period, B. PATER (*Ztschr. Pflanzenzücht.*, 1 (1913), No. 4, pp. 469-471).—The author reports that of several plants studied which gave some modification of their customary biennial habit in response to controlled conditions (phosphorus manuring, etc.), *Conium maculatum* and *Verbascum phlomoides* were induced to behave as annuals.

Relation of seed size to general development and anatomy of plants, M. DELASSUS (*Compt. Rend. Acad. Sci. [Paris]*, 157 (1913), No. 25, pp. 1452-1454).—The author reports that the limitation as to general development, and the final disproportion, noted in plants grown from the smaller seeds in case of horse bean, vetch, chick pea, white lupine, squash, and Indian corn, are comparable with the results previously noted as following partial suppression of reserve materials (*E. S. R.*, 30, p. 132).

The influence of temperature on phototropism in seedlings of *Avena sativa*, Miss M. S. DE VRIES (*K. Akad. Wetensch. Amsterdam, Proc. Sect. Sci.*, 15 (1913), pt. 2, pp. 1170-1174, figs. 2).—The author states that this preliminary report, giving results of studies on phototropism of seedlings of *A. sativa*, was called forth at this stage by the contribution of Nybergh (*E. S. R.*, 28, p. 630). It is stated that the lack of influence of temperature in phototropic stimulation reported by Nybergh is opposed to results obtained by the present author, who claims to have noted a definite influence and established optimal points for warming periods differing in duration.

On the connection between phyllotaxis and the distribution of the rate of growth in the stem, J. H. VAN BURKOM (*K. Akad. Wetensch. Amsterdam, Proc. Sect. Sci.*, 15 (1913), pt. 2, pp. 1015-1020, figs. 3).—This is a statement preliminary to the author's forthcoming thesis regarding periodic measurements made on various plants in the botanical garden at Utrecht.

Along with curves and other data presented, the statement is made that in *Asparagus officinalis*, *Gingko biloba*, *Hedera colchica*, and *Linum usitatissimum* growth increased regularly from below upward to a maximum, decreasing

above this, while *Acer dasycarpum*, *A. platanoides*, *Deutzia scabra*, *Lonicera tatarica*, *Syringa vulgaris*, and *Viburnum veitchi* showed a similar curve of growth rate, except that the zones containing nodes showed less growth than those nearest them. Shaded stems showed not only a somewhat greater rate of growth, but a longer period of growth for the nodes individually in some cases observed.

Relative transpiration in rain-forest and desert plants, F. SHREVE (*Abs. in Science, n. ser.*, 39 (1914), No. 998, p. 260).—The author defines relative transpiration as the ratio of the absolute transpiration of a unit area of leaf surface to the concurrent evaporation from a unit area of water. This is believed to give an index of the physiological control of transpiration and of the action of light upon it. The relative transpiration of a number of plants has been studied in Jamaica, representing rain-forest plants, and in Arizona, representing desert conditions.

A comparison of the rates of the relative transpiration in rain-forest and desert plants shows them to be of the same order of magnitude in the two groups. Since the annual evaporation total in Arizona is ten times that in Jamaica, it is said to show that the absolute transpiration per unit in plants of the desert is approximately ten times as great as it is in the rain-forest.

Relation of transpiration of white pine seedlings to evaporation from atmometers, G. P. BURNS (*Abs. in Science, n. ser.*, 39 (1914), No. 998, pp. 259, 260).—The author has reported on an attempt made to express the data recorded by meteorological instruments in terms of plant physiology and thus give them a botanical significance. Experiments were conducted in a state forest nursery with white pine seedlings, comparisons being made with black and white atmometers under half shade, no shade, and full shade. Comparing the water loss under the different conditions gave coefficients of transpiration by which the author claims it is possible to calculate the water loss from white pine seedlings from the evaporation from the atmometers.

Plants grown under the three conditions studied showed great variation in structure, in the amount of ash, and in their chemical composition. The amount of water transpired by the no-shade plants was many times that transpired by plants in half and full shade, but the percentage of ash figured on a dry matter basis was less in those plants than in either of the other two sets experimented upon. Half shade was found to reduce the transpiration and evaporation, but the graphs showed that the response of the plants and the atmometers was not identical.

Transpiration of *Silphium laciniatum*, L. A. GIDDINGS (*Abs. in Science, n. ser.*, 39 (1914), No. 998, pp. 258, 259).—Experiments carried on in the laboratory and field with *S. laciniatum* are reported. In both cases special attention was given to the effect of increased wind velocity on the rate of transpiration. In the laboratory transpiration was found to increase with wind velocity up to a certain limit, after which it did not increase in proportion as the wind velocities were increased. As a rule in the field experiments transpiration was found to be greatest before evaporation had reached the maximum.

The effect of certain surface films and dusts on the rate of transpiration, B. M. DUGGAR and J. S. COOLEY (*Ann. Missouri Bot. Gard.*, 1 (1914), No. 1, pp. 1-22, pl. 1; *abs. in Science, n. ser.*, 39 (1914), No. 998, p. 259).—Attention is called to the commonly observed fact that leaves of plants sprayed repeatedly with Bordeaux mixture may remain green and healthy at the close of the season several weeks after unsprayed leaves free from fungus disease have ripened. There seems to have been no data offered explaining the reason for this extended vegetative period.

A series of experiments was conducted in which standardized castor bean leaves and tomato plants were sprayed with Bordeaux mixture, aluminium mixture, lime, and certain other film-forming liquids and powders. In every case the rate of transpiration was higher in the Bordeaux sprayed plants than in the controls. The important differences observed make it necessary to give weight to increased transpiration in any explanation that is offered concerning the stimulating effect of Bordeaux mixture.

Relation of certain grass-green algae to elementary nitrogen, J. R. SCHRAMM (*Abstr. in Science, n. ser.*, 39 (1914), No. 998, pp. 260, 261).—The author states that the number of species of algae, in which the free nitrogen fixation has been investigated under pure culture conditions, is relatively small, not more than 4 or 5 genera having been so studied.

By a variety of methods 25 species were isolated as pure cultures, 2 of them being blue-green algae, 2 diatoms, and the remainder grass-green algae. Seven species of the latter were tested for nitrogen fixation in the complete absence of combined nitrogen. At the same time the effect of the slightly elevated temperature was determined in a duplicate series of experiments. No fixation of nitrogen was observed in any of the species and, unlike certain fungi, no favorable effect was exercised by the higher temperature.

Metabolism of the nitrogen in *Aspergillus niger*, H. J. WATERMAN (*K. Akad. Wetensch. Amsterdam, Proc. Sect. Sci.*, 15 (1913), pt. 2, pp. 1047–1057, fig. 1; *abs. in Jour. Chem. Soc. [London]*, 104 (1913), No. 610, I, p. 945).—The author summarizes the findings of this study substantially as follows:

The ratio of the nitrogen fixed to the carbon assimilated in *A. niger* lowered with time, becoming constant in the mature mold. The rapidity of the metabolism is subject to great changes, that of nitrogen resembling closely that of carbon as regards factors concerned in their production and rate of change. Metabolism of nitrogen is but little influenced by substitution of rubidium for potassium and is independent of the nitrogen source. No fixation of atmospheric nitrogen was observed.

Metabolism of the phosphorus in *Aspergillus niger*, H. J. WATERMAN (*K. Akad. Wetensch. Amsterdam, Proc. Sect. Sci.*, 15 (1913), pt. 2, pp. 1058–1063).—In addition to having shown (see above) that the metabolism of nitrogen in *A. niger* is analogous to that of carbon, the author further claims to have found that phosphorus behaves in much the same manner as do those two elements. It is held, further, that the quantities of the elements present in the mature mold do not correspond to the quantities really active during development, also that the same quantity of an element may be several times active in metabolism, one cell taking up the products given out by another.

Potassium, sulphur, and magnesium in the metabolism of *Aspergillus niger*, H. J. WATERMAN (*K. Akad. Wetensch. Amsterdam, Proc. Sect. Sci.*, 15 (1913), pt. 2, pp. 1349–1355).—Referring to the reports above noted, the author states that like carbon, nitrogen, and phosphorus, the sulphur is accumulated in the cell and afterwards partly excreted. In the physiological action of potassium two functions are to be distinguished, one corresponding with that of rubidium, the other with that of manganese. Magnesium differs from the other required elements in that strong concentrations and some time are required to produce any considerable growth therewith. It is thought that magnesium may act by counteracting some as yet unknown noxious factor present. Zinc can replace magnesium in the culture media, but the same is not true of beryllium, lithium, manganese, and calcium. No action by cadmium, strontium, and mercury analogous to that of zinc in this respect has yet become evident. Extremely slight quantities of zinc are sufficient to activate magnesium.

The influence of iron in the development of barley and the nature of its action, J. WOLFF (*Compt. Rend. Acad. Sci. [Paris]*, 157 (1913), No. 21, pp. 1022-1024).—In experiments briefly noted, neither chromium nor nickel was able to replace the iron constituent in the nutritive medium.

The catalytic action of iron in the development of barley, J. WOLFF (*Compt. Rend. Acad. Sci. [Paris]*, 157 (1913), No. 25, pp. 1476-1478).—In continuance of the studies above reported, the author found that while the addition of iron in the form of ferrocyanid or citrate increased the weight of the plant it did not increase in the same degree the amount of iron in the plant. The iron is thought, when present in appropriate concentration, to act as a catalyzer.

Influence of the salts common in alkali soils upon the growth of rice plant, V. K. MIYAKE (*Bot. Mag. [Tokyo]*, 28 (1914), No. 325, pp. 1-4).—Continuing work previously noted (*E. S. R.*, 30, p. 630) the author tested barium and strontium for indications of favorable action similar to that of calcium in neutralizing the toxicity of other metallic ions. It was found that the injurious effect of the metallic ions tested (magnesium and sodium in solutions of their chlorids) upon the growth of rice seedlings is perfectly counteracted only by calcium, strontium retarding only in a slight degree their toxic effect, and barium appearing actually depressive in its effect in this connection.

The antitoxic action of chloral hydrate upon copper sulphate for *Pisum sativum*, R. P. HIBBARD (*Centbl. Bakt. [etc.]*, 2. Abt., 38 (1913), No. 13-18, pp. 302-308, fig. 1; *abs. in Jour. Chem. Soc. [London]*, 104 (1913), No. 613, I, p. 1284).—During the summer of 1912 the author conducted experiments to learn what relation exists between two poisonous substances when one is a known narcotic. In these experiments copper sulphate and chloral hydrate were used in varying concentrations, and the effect on garden peas, as shown in the length of the roots, was determined.

Observations were made at the end of 24 and 48 hours, and the curves showed that poor growth took place in solutions where the single substances were used except at the lowest dilutions, while a noticeably better growth was obtained where the two substances were combined. The antitoxic action of the combined solutions was especially noticeable where the amounts of the different solutions were nearly equal.

A number of theories are proposed to explain the antagonistic action described above. These involve effects produced within the solution itself, in the plasma membrane, or within the cell, or possibly there may be a combination of all these effects. Another theory proposed to account for the action is that in the particular case studied the action of chloral hydrate in antagonizing copper sulphate might come about through the anticatalytic action of the organic substance.

The influence of etherization on certain enzymatic activities of bulbs and tubers, M. M. MCCOOL (*Abs. in Science, n. ser.*, 39 (1914), No. 998, p. 261).—Experiments were reported on the relative activity of diastases, oxidases, and catalase in etherized and natural bulbs and tubers. The activity in the enzymes in the material from the two sources was found to differ materially. Diastatic action was greater in the etherized tissues and this was also true for the action of oxidases and peroxidases. Catalase activity, however, was found to be diminished by etherization.

A preliminary report on the isolation and identification of the enzymes of *Fucus vesiculosus*, B. M. DUGGAR and A. R. DAVIS (*Abs. in Science, n. ser.*, 39 (1914), No. 998, p. 260).—It is stated that peculiarities in the carbohydrate and nitrogen metabolism of the *Fucaceæ* have made desirable a determination

of the enzym content of the growing tissues. Although employing various methods the authors were unable to find evidence to indicate the presence of any of the commoner carbohydrases except cellulase. The commoner esterases are likewise absent, but amidases are well represented. Urea, especially, is rapidly transformed and urease is apparently widely distributed in the tissues. Oxidases were not detected by any of the methods tested.

Recent cytological studies on the formation of anthocyanin pigments, A. GUILLIERMOND (*Compt. Rend. Acad. Sci. [Paris]*, 157 (1913), No. 21, pp. 1000-1002).—The author, reporting on his more recent work (E. S. R., 29, p. 827), states that anthocyanin and certain colorless compounds found therewith are always dependent upon mitochondrial activity. It is thought that while these coloring matters in general make their first appearance in the mitochondria as pigments, they may be the result of a gradual transformation of the colorless compounds above mentioned.

Experimental production of anthocyanin identical with that in autumn leaves, R. COMBES (*Compt. Rend. Acad. Sci. [Paris]*, 157 (1913), No. 21, pp. 1002-1005).—In a brief account given of a microchemical study of *Ampelopsis hederacea*, the author claims to have effected experimentally the alteration of coloring matters found in the green leaf into a substance responding to tests in the same manner as does the anthocyanin of red autumn leaves and therefore held to be identical therewith. The change is held to be connected with a process of reduction and not of oxidation (E. S. R., 23, p. 528).

Transformation of anthocyanin pigment of red autumn leaves into the yellow pigment proper to green leaves of the same plant, R. COMBES (*Compt. Rend. Acad. Sci. [Paris]*, 157 (1913), No. 25, pp. 1454-1457).—The author claims to have induced experimentally in leaves of ivy the converse of the change noted above in producing the yellow pigment from anthocyanin by a process of oxidation thereof. It is maintained that the above facts require a corresponding change from the views prevalent hitherto regarding the relations of those pigments to oxygen.

Growth stimulation by Roentgen rays of plant and animal tissues, E. SCHWARZ (*Umschau*, 18 (1914), No. 1, pp. 15, 16, figs. 2).—Besides brief notes of some experiments with Roentgen rays on animal tissues, the author describes briefly the effects of the rays on bean seedlings. Exposure for 30 seconds was without marked influence and 300 seconds duration resulted in complete arrest of development, but exposure for about 150 to 200 seconds gave vigorous growth.

Variability in a vegetatively pure line of a hermaphroditic *Mucor*, A. F. FLAKESLEE (*Abs. in Science, n. ser.*, 39 (1914), No. 998, pp. 256, 257).—The author states that separation cultures from a single spore sowing of the *Mucor* gave a small percentage of colonies that differed sharply from the stock form. The variations consisted in absence and increase or decrease of zygospore production as well as peculiarity in color and growth. Some of these variants are considered as only temporary conditions as they tend eventually to revert to the normal type. Others are believed to be more permanent, but have not yet been sufficiently investigated. All tend, at least in part, to reproduce the new characters and some have maintained these for several generations. It is stated that taxonomists would undoubtedly describe as distinct species these forms, which would all be derived from a single source.

On physiological isolation in types of the genus *Xanthium*, C. A. SHULL (*Abs. in Science, n. ser.*, 39 (1914), No. 998, p. 256).—Attention is called to remarkable variations in the burs of what has been considered *X. canadense* grown in this locality. Three distinct types were selected in the fall of 1912 and were grown together under identical conditions for breeding experiments.

These types bred true notwithstanding their close proximity in the field. Differences were noted, but because they bloomed at different times the types seemed to remain distinct, although there was some evidence that occasional hybrids might occur under natural conditions. In view of these variations, the author believes that the genus needs revision based upon experimental investigation.

Segregation of characters in first generation hybrids from stable species of *Oenothera*, G. F. ATKINSON (*Abs. in Science, n. ser.*, 39 (1914), No. 998, p. 256).—Reciprocal crosses have been made of two wild species, *O. nutans* and *O. pyenocarpa*, which have been cultivated through two generations. These two species are said to differ in a number of clearly observable characters and the reciprocal crosses have given rise to hybrids which show segregation of characters in the first generation. A number of the characters are contrast characters that behave as unit characters in segregation into twin and triple first generation hybrids.

Some correlation phenomena in hybrids, TINE TAMMES (*K. Akad. Wetensch. Amsterdam, Proc. Sect. Sci.*, 15 (1913), pt. 2, pp. 1004-1014).—This report has already been noted from another source (*E. S. R.*, 29, p. 424).

Bud variations in *Solanum*, E. HECKEL and C. VERNE (*Bul. Soc. Nat. Agr. France*, 73 (1913), No. 8, pp. 612-628).—The substance of this contribution has already been noted from another source (*E. S. R.*, 29, p. 829).

Symbiosis and tuberization in potato, J. MAGROU (*Compt. Rend. Acad. Sci. [Paris]*, 158 (1914), No. 1, pp. 50-53; *abs. in Rev. Sci. [Paris]*, 52 (1914), I, No. 3, p. 93).—Following up the findings and suggestions of Bernard (*E. S. R.*, 27, p. 224), the author made a study of the influence of fungi living in relations of commensalism in potato plants as related to the development thereof. From this, it is claimed, some evidence was secured regarding the alleged importance of fungi to tuber development.

Rejuvenescence of the potato, A. SARTORY, J. GRATIOT and F. THIÉBAUT (*Compt. Rend. Acad. Sci. [Paris]*, 158 (1914), No. 1, pp. 45-47; *abs. in Rev. Sci. [Paris]*, 52 (1914), I, No. 3, p. 93).—Taking the view that the potato has degenerated in consequence of its long continued asexual reproduction, and regarding with little hope certain efforts at rapid improvement of related wild forms as noted by Heckel and Verne (*E. S. R.*, 29, p. 829), the authors attempted to secure plants breeding persistently after production from the seed by employment of the supposedly stimulating effect exerted on tubers by certain fungi as noted by Bernard (*E. S. R.*, 27, p. 224). The results obtained in 1912 are said to have been encouraging as regards size, vigor, and health. Those of 1913 are claimed to have been still more so, leading to hopes of the complete practical success ultimately of the methods employed.

Inventory of seeds and plants imported by the Office of Foreign Seed and Plant Introduction during the period from April 1 to June 30, 1912 (*U. S. Dept. Agr., Bur. Plant Indus. Inventory No. 31* (1914), pp. 98).—This gives a list, together with economic notes, on miscellaneous importations of seeds and plants received, to the number of about 800, during the period indicated.

FIELD CROPS.

Report of the Mandalay Agricultural Station, 1911-12, E. THOMPSTONE (*Dept. Agr. Burma, Rpt. Mandalay Agr. Sta., 1911-12*, pp. 41+4).—This report gives results of manurial and cultural experiments with rice and variety tests with rice and other crops.

In comparing 240 and 480 lbs. bone meal, 60 lbs. saltpeter, 60 lbs. nitrate of soda, 200 and 400 lbs. cotton cake, and 12,000 lbs. barnyard manure per acre, the

plat receiving barnyard manure produced 1,886 lbs. rice per acre, the largest yield of any single application. The plat receiving barnyard manure with 240 lbs. bone meal gave the largest yield of any combined application, viz, 2,121 lbs. in 1911.

In another series of experiments the use of 12,000 lbs. of barnyard manure was followed by a yield of 2,559 lbs. rice per acre, a larger yield than either rice straw plowed under, ashes from rice straw, or ashes from 12,000 lbs. barnyard manure. A plat receiving burnt rice husks as a fertilizer produced 1,627 lbs. rice, as compared with 885 lbs. without fertilizer. A plat receiving 250 lbs. nitro-lime gave a yield of 1,295 lbs. rice per acre as compared with 1,346 lbs. with an application of 12,000 lbs. of barnyard manure. With a combination of 60 lbs. bone meal and 15 lbs. nitrate of soda per acre rice was produced of higher specific gravity than with any other sort of fertilizer tried, it weighing 53.87 lbs. per standard basket (4 gal.=45 lbs.) as an average of 3 years, 1910-1912.

In an experiment to determine the best distance to transplant rice, 8 by 9 in. was found to give the largest yield, 1,143 lbs. per acre. Of 1, 2, 3, and 4 seedlings in a hill, 2 seedlings gave the best results. In cultivation experiments sprouted rice sown broadcast and harrowed when the plants were 6 in. high gave the best results.

Report on the agricultural station, Orai, Jalaun [India], of the United Provinces of Agra and Oudh, for the years ending June 30, 1912 and 1913 (*Rpt. Agr. Sta. Orai, Jalaun [India], 1912-13, pp. 1-21*).—Some wheat variety tests are reported in which increased yields were obtained by irrigation. Results are also given of variety tests on various soils with cotton, peanuts, millet, pigeon peas, bulrush millet, sesame, gram, and flax, and manurial and tillage experiments as continued from the preceding year.

Crop rotation experiments at Gross-Enzersdorf, A. VON LIEBENBERG DE ZSITTIN (*Mitt. Landw. Lehrkanz, K. K. Hochsch. Bodenkul. Wien, 1 (1912), No. 1, pp. 1-56*).—This article gives results of several series of experiments which were carried on from 1904 to 1910 with spring and winter cereal rotations, and were designed to throw light on the relative value of fallow, green manure, barnyard manure, and commercial fertilizers.

It was found that the addition of 50 kg. of P_2O_5 per hectare (44.5 lbs. per acre) apparently increased the available nitrogen from 28.9 to 29.83 kg., and the available K_2O from 17.1 to 17.26 kg. per hectare in a continuous grain rotation. In one series an increase of 34.5 kg. of dry matter was attributed to each kilogram of a 50-kg. application of P_2O_5 . With an application of 30,000 kg. of barnyard manure, an increase of 11.15 kg. dry matter was obtained per 100 kg. of the manure.

It is noted that 15.82 per cent of an application of 50 kg. of P_2O_5 per hectare was utilized by the crop of cereals. In the case of the barnyard manure the crop utilized 16.3 per cent of the nitrogen, 23.8 per cent of the P_2O_5 , and 13.3 per cent of the K_2O , but when both of the fertilizers were applied together the utilization by the crop was 31.1 per cent nitrogen, 21.9 per cent P_2O_5 , and 27.1 per cent K_2O in a continuous cereal rotation.

By the introduction of fallow every fourth year into the grain rotation, an application of 50 kg. of P_2O_5 seemed to increase the available nitrogen from 28.9 kg. to 33.7 kg. per hectare, and the available K_2O from 16.9 to 21 kg. When an application was made in this series of 50 kg. of P_2O_5 per hectare, 25.8 per cent was utilized by the crop and an increase of 39 kg. of dry matter was obtained per kilogram of P_2O_5 applied. With barnyard manure an increase of 6.96 kg. per hectare was obtained per 100 kg. of the manure, and 24.7 per

cent of the nitrogen, 23.8 per cent of the P_2O_5 , and 20.4 per cent of the K_2O were utilized by the crop.

It is noted that in the rotations without fertilizers, but including the fallow, the annual available plant food was not increased, but that the accumulation due to fallow made possible larger yields for the 3 succeeding years than for the 4-year rotations without the fallow. When fertilizers were applied, however, it was found that the rotation including fallow fell behind in yields. In a series of 6-year rotations of cereals and sugar beets, the introduction of a vetch crop was followed by greater total yields than either fallow or green manure in the rotation. In this last series it was determined that 62.3 per cent of the nitrogen and 47.5 per cent of the P_2O_5 were utilized by the crop with the rotation including the fallow. With the rotation including the green manure it was found that 48.2 per cent of the P_2O_5 and 40 per cent of the nitrogen were utilized, and with the rotation including the vetch crop 61.4 per cent of the P_2O_5 and 62 per cent of the nitrogen. It is noted that barley gave larger yields, and richer in protein, following winter wheat than when following sugar beets.

The shooting of winter rye and winter wheat when spring sown, A. MURINOW (*Zhur. Opytn. Agron. (Russ. Jour. Expt. Landw.)*, 14 (1913), No. 4, pp. 238-254, figs. 2).—Experiments conducted in the greenhouse and in the field at the Moscow station showed (1) that spring-sown winter cereals may shoot without a rest period; (2) that the greater the environmental influences, the smaller the number of plants that came to head; and (3) that the influence of a low temperature was to decrease the number of plants that headed, apparently due to checking vegetative growth. As the greenhouse-grown plants were able to shoot without a rest period and the field-grown plants took a rest period, the author concluded that temperature was the factor that governed the rest period in winter cereals.

The influence of spacing on the development of single plants, E. SPERLING (*Fühling's Landw. Ztg.*, 62 (1913), No. 14, pp. 487-499).—In general, with wheat, rye, barley, and oats the total weight of plants increased with the increase in spacing, which ranged from 75 sq. cm. to 400 sq. cm. per plant. With rye, barley, and oats the weight on 400 sq. cm. of space was double that on 200 sq. cm. of space. The weight of grain did not increase so rapidly with increased space, and the percentage of grain to straw and chaff decreased. The average single kernel weights of all the cereals, except spring wheat, increased with the increase in space. With horse beans the total weight of plants and the number of beans per pod increased with the increase in spacing, which ranged from 200 to 1,600 sq. cm. The weight of beans increased more rapidly than the weight of straw and chaff. The percentage of beans to straw and chaff was the reverse of that of the cereals, it being the smallest with the smallest space and reaching the maximum at 800 sq. cm.

Plant breeding from the scientific standpoint, R. REGEL (*Trudy Büro Prikl. Bot. (Bul. Angew. Bot.)*, 5 (1912), No. 11, pp. 425-623; *Beilage*, 1912, Nov., pp. 18, pls. 18).—This work constitutes a discussion of the laws of heredity in their relation to the morphological and biological characteristics of plants, with special reference to cereals and to barley in particular. The findings and opinions of the leading investigators are noted in regard to the nonvariability of inherited factors, the general value of Mendel's law of segregation of characteristics, the prediction of inheritance in plant form, the evolution of the organism, systematic (taxonomic) factors, and the general principles of plant breeding.

Selection in pure lines, MRS. C. and A. L. HAGEDOORN (*Amer. Breeders Mag.*, 4 (1913), No. 3, pp. 165-168, fig. 1).—This points to results obtained by Vilmorin

in 50 years of selection in breeding pure lines of wheat without effect in changing the genetic factors. The authors note that when breeders of either plants or animals have obtained changes in the genetic factors they must have used heterozygous individuals for those factors.

Hybridization of cereal species, F. JESENKO (*Ztschr. Induktive Abstam. u. Vererbungslehre*, 10 (1913), No. 4, pp. 311-326, figs. 7).—The literature on the crossing of rye and wheat is reviewed briefly. The author then gives the results he obtained during 1909-1912 in attempting to cross-fertilize over 6,000 wheat and rye flowers, this resulting in only 35 hybrid kernels. The methods employed and the results obtained in the hybridization of wheat and rye, and in using the resulting hybrids in further crossbreeding, are explained and discussed.

It is noted that, judging from the small amount of material obtained, the genetic factors seem to segregate in generations of these hybridizations similar to those of variety crosses of cereals.

A study of mountain forage plants, F. BRIOT (*Jahrb. Weidew. u. Futterbaues*, 1 (1913), pp. 114-125).—This gives in tabular form the results of botanical analyses of open and wooded pastures in the central part of France, as studied in 1903 with a view to improvement. These results show that in general half of the growth found either in the open or in the woods was wild plants that could well be replaced with tame grasses before fertilizers could be used at a profit.

Fiber growing in Texas, W. D. HORNADAY (*Amer. Thresherman*, 16 (1913), No. 6, pp. 9, 10, figs. 3).—This article describes a new fiber plant belonging to the Agave family and which has been used as a basis of investigation by H. C. Stiles in the lower Rio Grande Valley territory. It is a plant described as being able to endure low temperatures, decorticating easily, and having a fiber of about 30 in. in length, the most important feature being its hardiness.

Analytical investigations and experiments in the cultivation of *Medicago sativa* in Uruguay, J. SCHRÖDER (*Rev. Inst. Agron. Montevideo*, No. 12 (1913), pp. 47-67).—The author reports mechanical and chemical analyses of alfalfa seed from different countries, and discusses the chemical analysis and feeding value of alfalfa hay found on the markets of Montevideo, the influence of time of harvest on the chemical composition and feeding value of alfalfa hay, and the effect of rain on the composition of hay. In fertilizer experiments the yields of green forage ranged from 51,700 kg. to 62,800 kg. per hectare, the largest yield being obtained with barnyard manure, superphosphate, and potassium sulphate. The yield without fertilizers was 23,000 kg. per hectare. The average composition of alfalfa hay on the Montevideo market was found to be water 10.3, protein 18.1, fat 3.1, nitrogen-free extract 31.6, crude fiber 26.9, and ash 10 per cent.

Berseem (*Trifolium alexandrinum*), M. CALVINO (*Hacienda*, 8 (1913), No. 12, pp. 368-370, figs. 5).—This gives a description and discusses the uses of this plant in Egypt, and rotations in which it is used there. Its cultivation in Italy is also noted. In trials at stations in central Mexico, a July 14 seeding produced as follows: August 27, 29,750 kg.; October 5, 31,000 kg.; November 5, 18,000 kg.; and December 21, 13,850 kg. per hectare. Four varieties, viz, Muscowi, Fachl, Saida, and Kadrawi are described, and a rotation of maize, wheat, and berseem for Mexico is discussed.

Experiments in electro-culture, GERLACH (*Mitt. Kaiser Wilhelms Inst. Landw. Bromberg*, 6 (1913), No. 1, p. 15).—The results here given with carrots show no noteworthy influence of electricity.

Contributions to the studies of castor beans, L. RIGOTARD (*Agron. Colon.*, 1 (1913), No. 1, pp. 15-21).—This gives descriptions and analyses of numerous

varieties of castor beans from Guinea, Ivory Coast, Upper Senegal and Niger, India, and Egypt. The data and analyses cover the weight of 100 seeds, which ranged from 8 to 22.3 gm.; the dimensions of the seeds, which ranged from 5 by 8 mm. to 7.5 by 11.3 mm.; and the percentages of moisture, oil (which was from 42.2 to 54.6 per cent), protein, lime, phosphoric acid, and potash.

Corn, A. M. TEN EYCK (*Kansas Sta. Bul.* 193 (1913), pp. 429-471, figs. 19).—This bulletin gives some results of testing 226 varieties of corn in the 7 years between 1903-1909, inclusive.

The data show that Kansas-grown seed produces 6.47 bu. more corn on the average per acre each year than the same variety grown from imported seed. It is noted that the high-yielding varieties varied with the year and that high yields are a matter of "breed" or variety, rather than a matter of color or maturing season. Kansas-grown seed usually made a lighter yield of stover than seed from other sources.

A brief history and the principal characteristics of 22 varieties of standard and native varieties of dent corn are given.

Seed corn for Kansas, L. E. CALL (*Kansas Sta. Circ.* 31 (1914), pp. 3).—This circular gives advice to Kansas farmers on buying seed corn locally.

Corn acidity investigation, H. J. BESLEY, G. H. BASTEN, and J. W. T. DUVEL (*Coop. Manager and Farmer*, 3 (1913), No. 2, pp. 47-49, figs. 6).—This paper reports some results of "acidity determinations that have been made on several thousand samples representing corn on the farm, as received at and shipped from country elevators and terminal markets, as loaded at seaports for export, and as discharged at foreign ports, together with representative samples of special lots of corn used in experimental work of storage, drier, and transportation, carried on by the Office of Grain Standardization [of the U. S. Department of Agriculture].

"The investigations show that there is a wide variation in the amount of acid existing in commercial corn and that this acid can be accurately measured. It establishes as a fact that corn which is sound and free from damage contains less acid than unsound or damaged corn. In a general way, the investigation also shows that the degree of acidity is directly proportional to the percentage of damage and to the commercial grading at terminal markets, and inversely proportional to the percentage of germination; that is, the lower the percentage of damage, the lower the acidity; the better the commercial grade, the lower the acidity; and the lower the percentage of germination, the higher the acidity. Drier experiments show that there is no material change in the acid content of the same corn before and after drying."

Rhodesian maize, J. A. T. WALTERS (*Rhodesia Agr. Jour.*, 11 (1913), No. 1, pp. 41-46, pls. 3).—In this article the author discusses the ear characteristics of the 2 varieties of corn chiefly grown in Rhodesia, viz, Hickory King and Salisbury White. The latter variety is a result of the union of Boone County White and White Horsetooth with Hickory King. Several features of the 8-, 10-, and 12-row types are noted, and a score card is presented.

Report on cotton cultivation, 1912, R. J. H. DELOACH (*Bul. Ga. State Col. Agr.*, 1 (1913), No. 2, pp. 7, pl. 1, figs. 2).—The work noted in this bulletin includes chiefly the testing of varieties, hybridization, and a type study of the cotton plant. This work was primarily for instructional purposes in the college.

A trial in spacing of cotton is reported in which the yields ranged from 2,000 to 3,000 lbs. per acre. The rows were 4 ft. apart. The smallest yield resulted from hills which were 3 ft. apart in the row, with 1 plant per hill, and the largest yield was from hills 18 in. apart, with 2 plants per hill.

Notes are given in regard to the cultivation of the Sunbeam variety of cotton in various parts of the State.

Cotton-seed selection for southeast Missouri, A. R. EVANS (*Missouri Sta. Circ.* 66 (1913), pp. 243-246, figs. 2).—This bulletin gives directions to growers for improving yields by planting their own selected seed.

A new forage plant, A. STOLZ (*Amer. Breeders Mag.*, 4 (1913), No. 3, pp. 162-164, fig. 1).—This describes *Desmodium hirtum* as found wild in German East Africa, and gives methods of propagation and improvement under cultivation and its uses as a cover and forage crop.

Kapok or cotton silk, H. POWELL (*Dept. Agr. Brit. East Africa Ann. Rpt.* 1911-12, pp. 91, 92).—The botanical species of this East African tree has not yet been determined. Experiments showed that 500 dry pods, including lint and seed, weighed 40 lbs., the hand-cleaned lint 8 lbs., and the seed 13 lbs.

Inoculation experiments with lupines, J. C. DE RUYTER DE WILDT and D. MOL (*Verslag. Landbouwk. Onderzoek. Rijkslandbouwproefstat. [Netherlands]*, No. 14 (1913), pp. 46-53, pls. 2).—Notes and data of pot experiments are given, in which three commercial cultures were employed with lupines in sandy soil. Irregular and unexpected results were obtained.

Experiments in the cultivation of peanuts in British India, A. CHEVALIER (*Jour. Agr. Trop.*, 13 (1913), No. 146, pp. 228-230).—Methods of cultivation are described, and tabulated data show yields, cost of production, and profits. The two early varieties tested yielded 921 kg. and 1,062 kg. of nuts in the shell, and 1,905 kg. and 1,746 kg. of straw per acre, respectively. The two late varieties yielded 842 kg. and 1,204 kg. of nuts in the shell, and 2,685 kg. and 2,757 of kg. straw per acre, respectively.

Potato culture, A. DICKENS (*Kansas Sta. Bul.* 194 (1913), pp. 473-491, figs. 4).—This bulletin discusses cultural methods for potatoes in Kansas, including crop rotation, fertilizers and manures, seed varieties, diseases and insects and their control, and spray materials and machinery.

It is noted that results of experiments at the station indicate the advantage of rotation of crops previous to a potato crop, and early fall plowing with shallow spring plowing on heavy soil.

Potato culture (*Scot. Farmer*, 21 (1913), No. 1083, pp. 939, 940).—This reports results of field tests of 11 varieties of potatoes in the vicinity of Edinburgh, Scotland, in connection with the use of muck and commercial fertilizers in the drill. Seven yards of 28-in. drills gave total yields ranging from 22 to 43 lbs., total numbers ranging from 132 to 461 tubers, and marketable tubers ranging from 60 to 107. It is noted that a dry spray has been used with great success in the production of this crop.

The effect of ferrous sulphate on the quality and quantity of potatoes, D. R. EDWARDES-KER (*Jour. Southeast Agr. Col. Wye*, No. 21 (1912), pp. 275-295, figs. 2).—This reviews the work of other investigators along this line and gives results of field experiments which did not conform closely to those quoted. The use of ferrous sulphate as a top-dressing on potatoes was found to give no increase in yield up to $\frac{3}{4}$ cwt. per acre of the iron salt, nor was there found to be any alteration of the quality of the tubers after cooking, or in the composition of their ash after incineration.

"As a tentative theory is advanced the suggestion that the effect of ferrous sulphate is considerably affected by the amount of calcium carbonate in the soil experimented upon, the larger the amount of calcium carbonate the less the effect of the ferrous sulphate. This is probably due to a chemical action between the calcium carbonate and the ferrous salt, whereby ferric oxid is produced by oxidation more quickly than would otherwise be the case."

A bibliography of 13 titles is appended.

Experiments with varieties of rice at the botanic gardens, 1912, J. B. HARRISON (*Jour. Bd. Agr. Brit. Guiana*, 7 (1913), No. 1, pp. 42, 43).—This gives the results of variety tests of rice for the period 1905–1912 in which the yields ranged from 14.9 bags (1,788 lbs.) to 42.7 bags per acre. The effect of sulphate of ammonia as a fertilizer was apparently to reduce the yield from 43.7 to 40.8 bags per acre, this being due chiefly to lodging.

Results of tests of new varieties of rice, I. E. FERRARI (*Bul. Agr. [Milan]*, 47 (1913), No. 42, pp. 1, 2).—This gives trial results of 11 new varieties of rice introduced into Italy from the Orient.

Drying rice in storage, G. Pozzi (*Bul. Agr. [Milan]*, 47 (1913), Nos. 37, p. 1; 38, pp. 1, 2; 39, pp. 1, 2).—This discusses methods of artificially drying rice placed in storage in September, October, and November, and the influence of temperature, hygroscopic moisture, and ventilation.

The cultivation of sugar beets, L. MALPEAUX (*Vie Agr. et Rurale*, 2 (1913), No. 24, pp. 691–695, figs. 4).—This article discusses methods of cultivation with special reference to time and means. It is noted that thinning should leave the best plants at regular intervals and that this work should be done early. When thinning was done on June 7, 12, and 19, the beets contained 19.6, 19.5, and 18.9 per cent of sugar, and yielded 6,350, 6,280, and 5,517 kg. per hectare, respectively. In comparing the results of a pneumatic machine and handwork in thinning, the yields for 1910 showed 15.16 per cent of sugar where hand-worked and 15.25 per cent where machine worked, and in 1912, 18.81 and 19.14 per cent, respectively, with yields per hectare in similar ratio.

The composition of sugar beets in the drought of 1911, and the influence of the following rains, J. URBAN (*Ztschr. Zuckerindus. Böhmen*, 37 (1913), No. 6, pp. 303–308).—Two hundred beets were gathered 2 days before a severe drought was broken by a period of wet weather, during which 81.7 mm. of rain fell and produced a luxuriant growth of the severely drought-affected beets. One hundred and fifty beets were also gathered on October 4 and the analyses of these compared with the analyses of the beets gathered before the rains, from which the author drew the following conclusions:

In spite of the yellow and wilted leaves, the beets gathered during the drought had not matured; this was concluded because of the large amount of total nitrogen (especially of proteid nitrogen) and alkalis and the relatively small amount of calcium that was found. Even when rains fall such dried-out beets are not in position to take up plant food at once, because of the scarcity of root hairs, but must first form root hairs from the substance of the roots before assimilation can be resumed in a normal way. The sugar-forming ability of the beets had been permanently injured by the dry weather, for with resumed growth only 0.62 gm. of sugar per 100 gm. of dry matter was produced in September, as compared with 1.82 gm. for the same period in a normal season. During the long drought considerable quantities of nonproteid nitrogen were stored in the root and during the rain period that followed were transformed into proteid nitrogen, and these changes going on at this time gave a quality to the juices of the beet that was unfavorable for the sugar manufacturers.

Statistics of sugar in the United States and its insular possessions, 1881–1912, F. ANDREWS (*U. S. Dept. Agr. Bul.* 66 (1914), pp. 25).—According to this compilation of statistics, “there was a great increase in the consumption of sugar in contiguous United States during the period covered by the bulletin, 1881–1912. . . . The average annual consumption, which in the fiscal years 1881–1885 was 46 lbs. per capita, was more than 78 lbs. in 1906–1910. The total

annual consumption increased from an average of 2,500,000,000 lbs. in 1881-1885 to practically 7,000,000,000 lbs. in 1901-1910, and in the fiscal year 1912, to a total of 7,900,000,000 lbs.

"The large increase in consumption was coincident with a greater home production. The cane-sugar output increased considerably, while beet sugar, the production of which amounted to little in the early eighties, far exceeded that of cane sugar in contiguous United States in the last few years. . . .

"The sugar supply of the United States proper has always been derived chiefly from abroad, and, even with a greatly increased home production in 1906-1910, the portion of supply received from domestic factories made only 23 per cent of the total consumption; this was more than twice the corresponding percentage for 1881-1885. The insular possessions—Hawaii, Porto Rico, and the Philippine Islands—furnished nearly 22 per cent, and the rest, amounting to 55 per cent, came from foreign countries during 1906-1910."

Tables show the production of sugar in the United States and its insular possessions; the consumption of sugar in contiguous United States and its sources; average yield of refined sugar per acre of beets or cane in contiguous United States, and of cane in Hawaii; production of cane sirup and cane molasses in the United States, 1899-1909; sugar production in Louisiana, Hawaii, and Porto Rico; production of sorghum sirup, sorghum cane, maple sugar, and sirup in the United States; monthly prices of sugar; freight rates; and international trade in sugar.

The sugar industry (*Thirteenth Census U. S., 10 (1910), pp. 471-483*).—Statistics for 1909 of the cane and the beet sugar industry of the United States, its territories and possessions are reported in detail.

Tobacco culture, W. W. GARNER (*U. S. Dept. Agr. Farmers' Bul. 571 (1914), pp. 15, figs. 4*).—This bulletin contains cultural and curing notes of several varieties of each of 3 general classes of tobacco: Cigar tobaccos, export tobaccos, and manufacturing tobaccos.

The growing of tobacco for nicotin extraction, G. H. GARRAD (*Jour. Southeast. Agr. Col. Wye, No. 19 (1910), pp. 262-317, pls. 4, fig. 1; No. 20 (1911), pp. 367-393; No. 21 (1912), pp. 429-438*).—This paper discusses the value of nicotin as an insecticide, the factors influencing the nicotin content of tobacco (variety, soil and climate, manuring, time of harvesting, and spacing of plants), the botanical characters of tobacco, and the practical management of the crop.

The results of the experiments of 1910 showed (1) that a rich soil produced a higher percentage of nicotin, (2) that an excess of nitrogenous fertilizer seemed to increase the nicotin content, (3) that spacing the plants $1\frac{1}{2}$ by 3 ft. apart gave the greatest yields of nicotin per acre, (4) that neglect to top or disbud reduced the yield of nicotin, and (5) that low topping (at 8 to 10 leaves) gave greater yields than high topping. In 1911 the reverse was true in regard to topping.

The best time to cut was found to be at maturity. Varieties of *Nicotiana rustica* seem to contain a higher percentage of nicotin than those of *N. tabacum*. It is noted that a yield of from 70 to 150 lbs. of nicotin per acre may be expected. Analytical data are given in tabular form.

The book of vetch, W. C. SMITH (*Delphi, Ind., 1912, pp. 157, pls. 25*).—The author has treated this subject with special stress upon the soil-improving qualities of the plant. The chapters cover its history, varieties, characteristics, seeds and seeding, vetch as a cover crop, vetch and bees, vetch as a green manure and as a forage plant, the bad points of vetch, and vetch and potatoes. There are also included the experiences of vetch growers in many parts of the United States.

Some varieties and strains of wheat and their yields in South Dakota, A. N. HUME and M. CHAMPLIN (*South Dakota Sta. Bul.* 146 (1913), pp. 267-296, figs. 8).—Some varieties of wheat, classified as common, durum, and Emmer, are described and illustrated with historical sketches. Tests of several varieties at Brookings, Cottonwood, Eureka, and Highmore showed Kubanka and Arnautka durum to rank first, Bearded Fife second, and Bluestem and Beardless Fife third in yield. Yields ranged from 0 to 36.7 bu. per acre for a period from 1905 to 1912.

History and culture of Marquis wheat, A. C. ARNY (*Minnesota Sta. Bul.* 137 (1914), pp. 5-8, figs. 2).—This article gives history, plant, and kernel characteristics and results of cultural tests that show this variety compared well with Velvet Chaff and Minnesota Nos. 163 and 169 in yield, weight per bushel, and maturity, especially on the heavier, more productive soils.

The trade in registered seed, L. H. NEWMAN (*Jour. Amer. Soc. Agron.*, 5 (1913), No. 1, pp. 52-54).—It is noted that registered seed, which represents the progeny of elite stock seed that has passed the inspection of the Canadian Seed Growers' Association, outyields ordinary seed. Data received from 30 growers of Banner oats in Canada showed an average yield of 51 bu. per acre from registered seed, as compared with 43.5 bu. with ordinary seed. The former weighed 41 lbs. per bushel and the latter only 35.8 lbs.

Experiments with hard-coated clover seeds, K. MÜLLER (*Ber. Grossh. Bad. Landw. Vers. Anst. Augustenb.*, 1912, pp. 81-86).—In germination tests with alfalfa seeds, those germinating after 10 days were classed as hard-coated, and further observations up to the forty-fifth day showed in some cases as high as 84.9 per cent germination of the hard-coated seeds. By soaking both red clover and alfalfa seeds for 6 hours in water at a temperature of 34° C. (93.2° F.), increased yields of hay were secured over the untreated seed. This was attributed to the more complete germination of the hard-coated seeds.

Victory over quack grass, V. C. MILLER (*Iowa Agr.*, 14 (1913), No. 2, pp. 78, 79, fig. 1).—This describes 2 successful methods of killing quack grass. One, for large tracts, consisted in plowing the quack grass area 3 to 4 in. deep, exposing the roots to the action of the sun; and the other, for small areas, consisted in covering the area completely with tar paper for a few weeks.

HORTICULTURE.

The vegetable garden, J. G. BOYLE (*Indiana Sta. Bul.* 171 (1914), pp. 377-418, figs. 23).—In order to secure accurate information on the various garden operations the station designed and operated a vegetable garden to meet the needs of a family of 5 persons during the seasons 1910 to 1912, inclusive. The present bulletin, which discusses the arrangement, planning, and care of a vegetable garden, is based upon the results secured in the 3 years' work in the station garden.

The subject matter is discussed under the following general headings: The garden plan; varieties, seed purchasing, and seed testing; hotbeds, cold frames, and forcing boxes; management; insect and fungus control; and cost and returns.

Intensive production of the artichoke in Gironde, B. DE LA GIRODAY (*Vie Agr. et Rurale*, 3 (1914), No. 12, pp. 331-335, figs. 5).—In addition to cultural details attention is also called to the pests and diseases of the globe artichoke.

Experiments on selection and inheritance by vegetative propagation of *Allium sativum*, P. VÖGLER (*Ztschr. Induktive Abstam. u. Vererbungslehre*, 11 (1914), No. 3, pp. 192-199, figs. 2).—In the experiments here described the author

sought to determine whether pure strains of garlic may be isolated by selection and whether having once secured these strains any further improvement could be obtained by selection. His results indicate that strains can be selected from a population of garlic plants which have a definite number of cloves to the entire bulb. Selection within these strains based on the weight of the bulbs appears to be of no value.

Varying valence of the characters of *Pisum sativum* as the blooming period progresses, E. ZEDERBAUER (*Ztschr. Pflanzenzücht.*, 2 (1914), No. 1, pp. 1-26, figs. 6).—The author presents the results of a study of F_1 and F_2 crosses of the garden pea which were conducted to determine what influence the crossing of even and uneven aged blooms has upon the offspring. Direct and reciprocal crosses were made between a green wrinkled-seeded variety and a yellow smooth-seeded variety. Crosses were also made between even aged blooms and early, middle season, and late blooms.

Although no general conclusions are drawn from the author's work the results are offered as a preliminary contribution to the subject of variability in character valence. Two forms of valence are recognized: Quantitative (räumliche) valence in which the valence of one character in relation to another is compared, and time (zeitliche) valence in which consideration is given to the varying valence in individual characters during the blooming period of a plant.

For the crosses in question it appears that one unit of a character pair is either prevalent (dominant) or subvalent (recessive) to the other. Yellow and smooth are prevalent to green and wrinkled. With reference to time valence the valence of any character appears to be at its highest in the early blooms and to diminish continually throughout the blooming period. A character, whether prevalent or subvalent, appears to have a greater influence on the progeny when transmitted by the female parent than when transmitted by the male parent.

Fruit and vegetable transportation and storage investigations of the United States Department of Agriculture, A. V. STUBENRAUCH (*Proc. Amer. Warehousemen's Assoc.*, 23 (1913), pp. 116-142).—A paper with the discussion following in which the author reviews some of the more recent investigations of the Bureau of Plant Industry along fruit transportation and storage lines.

Pruning young fruit trees, H. E. TRUAX (*Arkansas Sta. Circ.* 20 (1913), pp. 4, figs. 2).—A popular discussion of pruning methods as employed for young apple, peach, cherry, pear, and plum trees.

Apple growing (*Mass. [Bd.] Agr. Bul.* 2, 4, rev. ed. (1913), pp. 230, pls. 25, figs. 27).—The present edition of this bulletin (E. S. R., 21, p. 140) has been revised to include some of the more recent articles relating to apple culture in Massachusetts. A bibliography of literature dealing with various phases of apple culture is appended.

Apple growing in New Jersey, A. J. FARLEY (*New Jersey Stas. Circ.* 30, pp. 3-7, fig. 1).—This circular comprises a brief discussion relative to the adaptability of New Jersey for apple culture, with special reference to favorable climatic and soil conditions. A general list of varieties adapted for commercial planting in the State is also given.

Marked modifications in the form of pears, P. PASSY (*Jour. Soc. Nat. Hort. France*, 4, ser., 15 (1914), Feb., pp. 103-105, figs. 2).—The author here describes variations from the typical shape in certain varieties of pears which are growing close together. Comparison of the different normal and abnormal shaped types indicates that xenia has taken place.

Influence of foreign pollen, A. OTTO (*Illus. Schles. Monatschr. Obst, Gemüse u. Gartenbau*, 3 (1914), No. 3, pp. 48-50, fig. 1).—The author pollinated flowers

of the Angoulême pear with pollen of the Josephine of Malines pear. Although the immediate fruit resembled the male parent in size and shape, it resembled the female parent in both color and flavor. This phenomenon is attributed to xenia.

A new graft hybrid, L. DANIEL (*Compt. Rend. Acad. Sci. [Paris]*, 157 (1913), No. 21, pp. 995-997).—In the graft hybrid here described, which was observed at the base of an old pear tree grafted on quince stock, shoots possessing characters more or less intermediate between the pear and quince were found to have developed on a quince root. These shoots were located about 5 or 6 cm. beyond the root cushion and about the same distance away from the trunk of the stock.

Imported varieties of the avocado for California, K. A. RYERSON (*Pomona Col. Jour. Econ. Bot.*, 3 (1913), No. 1, pp. 424-439, figs. 11).—The author here presents a list of imported varieties of avocados now being tried out in California. Wherever possible a complete pomological description of the variety is also given.

A list of avocados originating in California has previously been noted (E. S. R., 29, p. 838).

The chemical composition of Florida oranges from October 1, 1912, to January 31, 1913, A. M. HENRY (*Fla. Quart. Bul. Dept. Agr.*, 24 (1914), No. 1, pp. 155-204, pls. 2).—The author here reports an investigation conducted in order to obtain data upon which to base a standard for ripe or mature oranges, such standard to be used in carrying out the provisions of the Florida immature citrus fruit law, the text of which is given.

In this study analyses were made of 259 samples of oranges taken from 17 localities in the State. From the data secured and here presented the author concludes that a standard of 1.25 per cent of total acid, determined as crystallized citric acid, is scientifically accurate, fair, and just to the producer and consumer alike, and of the greatest ease of practical application to the orange industry. The application of this standard is recommended and directions are given for conducting both field and laboratory tests.

Planting persimmons, H. H. HUME (*Jour. Heredity*, 5 (1914), No. 3, pp. 131-138, figs. 4).—The author's investigations have shown that with very few exceptions the varieties of the Japanese persimmon (*Diospyros kaki*) require pollenizers and that where pollenizers are planted in the orchards fertilization takes place readily by means of insects. On the other hand, it has been difficult to secure satisfactory pollenizers since in the varieties observed there is a tendency for staminate flowers to appear only at irregular intervals. The evidence at hand thus far shows that staminate flowers of *D. virginiana* will not fertilize the flowers of *D. kaki*. One tree of *D. kaki* growing at Eagle Lake, Fla., has been found to be constantly staminate. This variety has been named Gailey and is recommended as a general pollenizer for the Japanese varieties.

A planting plan is submitted which provides for 1 staminate tree to about 7 or 8 pistillate trees. It is pointed out that this proportion of staminate trees may be greatly reduced in the light of further observations.

Such seedless varieties as the Tanenashi and the Tamopan appear to set fruit well without pollination, the ovules of the former variety at least being largely sterile.

A preliminary note on the genetics of *Fragaria*, C. W. RICHARDSON (*Jour. Genetics*, 3 (1914), No. 3, pp. 171-177, pl. 1, figs. 4).—This comprises a brief progress report on some crossing experiments with strawberries which were started in 1910.

Runner×runnerless alpine plants gave runner-producing plants in F_1 and both runner and runnerless plants in F_2 , the runner being a marked dominant. Runnerless white-fruited plants crossed with runner-producing red-fruited plants gave red-fruited in F_1 and 70 red-fruited plants to 20 white-fruited in F_2 with no intermediates.

Vine pruning in California, I. F. T. BIOLETTI (*California Sta. Bul.* 241, pp. 48, figs. 21).—This is the first of a series of two bulletins dealing with the pruning of *Vitis vinifera* varieties of grapes. The present bulletin, which discusses the principles of pruning, incorporates the experience of the older and more skillful grape growers and the result of experiments and observations of the station workers.

Under the general heading of principles of pruning consideration is given to physiological principles of pruning; winter pruning; summer pruning, including disbudding, thinning of shoots and topping of young vines, suckering, water sprouting, pinching, topping, defoliating, thinning the fruit, ringing, and cutting the surface roots; restriction and treatment of wounds; supports; pruning tools; and principle of economy.

Introductory considerations include a discussion of the results of defective pruning and the habits and characteristics of the vine, with special reference to *Vinifera* varieties.

Old and new hybrids in 1913, E. PÉE-LABY (*Jour. Soc. Cent. Agr. Haute-Garonne*, 24 (1914), No. 250, pp. 22-48).—This is the usual annual report upon various direct bearing hybrid grapes with reference to their character, growth, resistance to mildews, insect attacks, etc. (E. S. R., 28, p. 840).

Viticulture in Algeria, C. VON DER HEIDE (*Landw. Jahrb.*, 45 (1913), No. 3, pp. 439-502, pls. 2, figs. 5).—This comprises a statistical review of the grape industry in Algeria since 1850, together with information relative to viticultural practices, the grape-growing districts, varieties grown, wine making, etc.

Planting in Uganda, E. BROWN and H. H. HUNTER (*London and Dublin*, 1913, pp. XVI+176, pls. 35, figs. 9).—A guide to the establishment, culture, and management of plantations in Uganda. The subject matter embodies the experience of the authors principally in the establishment of Para rubber, coffee, and cacao plantations. Chapters dealing with insect pests and fungus diseases, together with data on the cost of establishing plantations and preparing products, are also included.

The results at the Buitenzorg Gardens with green manure crops, W. M. VAN HELTEN (*Meded. Cultuurtuin [Buitenzorg]*, No. 1 (1913), pp. 19, pls. 9; *abs. in Roy. Bot. Gard. Kew, Bul. Misc. Inform.*, No. 1 (1914), pp. 21-24).—The results secured with various plants used as green manures during the past 4 years in plantations of coffee, rubber, cacao, etc., at the experimental gardens are reported.

The banana, its cultivation, distribution, and commercial uses, W. FAWCETT (*London*, 1913, pp. XI+287, pls. 8, figs. 10).—A handbook of information on the banana based on the author's observations and studies in Jamaica, as well as on a review of the literature of the subject. Most of the subject matter has previously appeared in the author's notes on the banana (E. S. R., 28, p. 743).

[Cacao manurial plats in Dominica], H. A. TEMPANY (*Imp. Dept. Agr. West Indies, Rpt. Agr. Dept. Dominica*, 1912-13, pp. 24-34, pl. 1).—As in previous years the results from the long-continued fertilizer and mulching experiments with cacao (E. S. R., 29, p. 42) show that natural organic manures, either in the form of pen manure or compost, are superior to any other form of fertilizer if they can be obtained in sufficient quantity. When sufficient organic manures are not available they may be supplemented to advantage by artificial manures containing nitrogen and phosphate.

The control of imported tea seed, C. BERNARD and J. J. B. DEUSS (*Dept. Landb., Nijr. en Handel [Dutch East Indies], Meded. Proefstat. Thee, No. 22 (1913), pp. 38, figs. 6*).—This comprises a preliminary report on tests of some 30 types of British India tea seed, conducted with the view of securing a better grade of seed for planting in Java. The viability of the seed was determined both by the specific gravity test (E. S. R., 30, p. 444) and by actual germination tests. Consideration is also given to seed containers, methods of packing, etc.

Hazelnuts, E. GROSS (*Österr. Gart. Ztg., 9 (1914), No. 1, pp. 17-19*).—In continuation of previous reports (E. S. R., 28, p. 238) tabular data are given showing the yield of several different varieties of hazelnuts in 1913, as well as the total yield for each variety from the time it commenced to bear.

Our hardy perennial plants, edited by E. GRAF SILVA TAROUCA (*Unsere Freiland-Stauden. Vienna and Leipsic, 1913, 2. rev. and enl. ed., pp. 382, pls. 12, figs. 417*).—A handbook of all the known hardy, ornamental perennial plants of central Europe prepared by various authorities on the subject and issued under the auspices of the Dendrological Society of Austria-Hungary.

In part 1 consideration is given to the use of perennial plants in park and garden, alpine plants and their utilization in the garden, the more important perennial plants for general culture, new and hardy perennial plants from China, and short instructions on the culture, propagation, and care of perennial plants. In part 2 all of the perennial plants listed in the trade at the present time are arranged in alphabetic order according to species and discussed with reference to their cultural requirements, appearance, blooming time, and cultural value. Lists are then given of the best sorts for cut flowers and for forcing purposes. The plants are also arranged with reference to certain characteristics, such as their soil requirements, blooming period, color of flower and fruit, etc. The text is fully illustrated with photographic reproductions.

Our hardy conifers, edited by E. GRAF SILVA TAROUCA (*Unsere Freiland-Nadelhölzer. Vienna and Leipsic, 1913, pp. 301, pls. 12, figs. 307*).—A handbook of the coniferous trees and shrubs of central Europe prepared by various authorities and issued under the auspices of the Dendrological Society of Austria-Hungary.

Part 1 consists of a number of special articles dealing with conifers in park and garden, the conifers of China and North America, the utilization of foreign conifers for forest culture, the breeding, propagation, and culture of conifers, and pests and diseases of conifers. Part 2 contains a systematic review of the principal groups of conifers based on flower and fruit characters, and a key to the species based upon branch, bud, and leaf characters. An alphabetic enumeration is then given of species including the more important varieties and types, with brief notes on their cultural requirements, appearance, and value. Groupings are next given of forms arranged according to various characteristics, such as cultural conditions, color, size, height, shape, etc. The text is fully illustrated.

Our hardy deciduous trees and shrubs, edited by E. GRAF SILVA TAROUCA (*Unsere Freiland-Laubgehölze. Vienna and Leipsic, 1913, pp. 419, pls. 16, figs. 495*).—A handbook similar to the above in preparation and arrangement.

FORESTRY.

The training of a forester, G. PINCHOT (*Philadelphia and London, 1914, pp. 149, pls. 8*).—The purpose of this popular work is to describe the more important phases of the forester's life and the forester's work in national, state, and private forests and forest enterprises. The book is written especially for those who are contemplating forestry as a profession.

Forestry in America as reflected in Proceedings of the Society of American Foresters, B. MOORE (*Forestry Quart.*, 12 (1914), No. 1, pp. 47-69).—This comprises a review of the progress of American forestry as reflected in the Proceedings of the Society of American Foresters. The various articles appearing in the first seven volumes of the Proceedings are here arranged under different headings in chronological order and briefly abstracted.

Tenth annual report of the state forester [of Massachusetts], F. W. RANE (*Ann. Rpt. State Forester Mass.*, 10 (1913), pp. 114, pls. 11, fig. 1).—This is the customary review of forest operations in Massachusetts for 1913, including the work on the state nurseries and plantations, assistance rendered to private woodland owners, fire protection work, suppression of the chestnut bark disease and the gipsy and brown-tail moths, parasite work in connection with the control of these moths, new legislation, and a financial statement for the year.

A glimpse of Austrian forestry, T. S. WOOLSEY, JR. (*Proc. Soc. Amer. Foresters*, 9 (1914), No. 1, pp. 7-37, pls. 9).—A descriptive account of forestry methods in Austria, including considerable information relative to the administration of Austrian forests.

A statistical review of the forest administration of the Grand Duchy of Baden for the year 1912 (*Statist. Nachw. Forstverw. Baden*, 35 (1912), pp. XXXIII+183, figs. 11).—This is the customary statistical report on the administration, management, and exploitation of the crown, community, and corporation forests of the Grand Duchy of Baden during 1912. Data are given on forest areas, various operations in the forests, yields in major and minor forest products, and financial returns. Comparative data are also given showing the net returns from the crown forests for each of the previous 45 years.

Report of the forestry department for the year ended June 30, 1913, R. DALRYMPLE-HAY (*Rpt. Forestry Dept. N. S. Wales*, 1913, pp. 24, pls. 6).—In addition to a progress report of forest operations in New South Wales, including a financial statement for the year ended June 30, 1913, the following three departmental bulletins are appended: Climatic Influence of Forests, by L. A. Fosbery; The Forests of the Bellinger River, by E. H. F. Swain; and Reafforestation of Depleted Hardwood Areas in the Coastal Districts of New South Wales, by C. J. Clulee.

Climatic characteristics of forest types in the central Rocky Mountains, C. G. BATES, F. B. NOTESTEIN, and P. KEPLINGER (*Proc. Soc. Amer. Foresters*, 9 (1914), No. 1, pp. 78-94).—This comprises a progress report on an experiment which was started under the direction of the Forest Service of the U. S. Department of Agriculture at the Fremont Experiment Station in 1910 and at the Wagon Wheel Gap Experiment Station in 1911 to compare the climatic characteristics of the various forest types which occur in two localities of southeastern and southwestern Colorado for a short term of years, and to compare the characteristics of similar types in the two localities for a long term of years.

The relation of the surface cover and ground litter in a forest to erosion, M. J. GLEISSNER (*Forestry Quart.*, 12 (1914), No. 1, pp. 37-40).—The author cites the experience in a Bavarian forest to show that the constant removal of forest litter is an important cause of erosion on hillsides. The prevention of erosion under these conditions by the construction of a series of horizontal transverse ditches is here described.

Effective fertilizers in nurseries, G. A. RETAN (*Forestry Quart.*, 12 (1914), No. 1, pp. 34-36).—As a result of fertilizer experiments which have been conducted in two nurseries of the Pennsylvania department of forestry for the past three seasons the author concludes that chemical fertilizers can best be

applied in connection with a green crop planted preliminary to starting forest seed beds.

Some Douglas fir plantations.—IV, Tortworth Wood, Gloucestershire (*Jour. Bd. Agr. [London]*, 20 (1914), No. 10, pp. 865-875, figs. 2).—In continuation of previous observations on Douglas fir plantations (E. S. R., 30, p. 446) a record including growth and yield tables is given for a small Douglas fir stand, part of which was planted in 1872 and part in 1883.

Protomorphic shoots in the genus *Pinus*, A. G. HARPER (*Quart. Jour. Forestry*, 8 (1914), No. 2, pp. 101-106, fig. 1).—The author here records some personal observations on the occurrence of protomorphic shoots in various species of the genus *Pinus* and gives a brief bibliography of references to the subject.

Ray tracheids in *Sequoia sempervirens* and their pathological character, W. S. JONES (*Quart. Jour. Forestry*, 8 (1914), No. 2, pp. 81-94, pls. 3, figs. 6).—The author here describes in detail ray tracheids which have been observed a number of times in the wood of *S. sempervirens*.

Cost accounts for reconnaissance surveys, A. B. CONNELL (*Forestry Quart.*, 12 (1914), No. 1, pp. 44-46).—A system of cost accounting to be applied in making reconnaissance surveys is here described in detail.

Graded volume tables for Vermont hardwoods, I. W. BAILEY and P. C. HEALD (*Forestry Quart.*, 12 (1914), No. 1, pp. 5-23).—The authors here present and discuss graded log scales and volume tables for beech, hard maple, and yellow birch based on measurements of 1,200 trees in the woods and 3,500 logs in the mill. They conclude from their investigation that local volume tables can be prepared rapidly and economically if based upon mill tallies made from all merchantable logs.

Forest products of Canada, 1911.—Poles and cross-ties, R. G. LEWIS and W. G. H. BOYCE (*Dept. Int. Canada, Forestry Branch Bul.* 35, rev. ed. (1914), pp. 17).—A previous edition of this bulletin has been noted (E. S. R., 28, p. 645).

[The wood industry] (*Thirteenth Census U. S.*, 10 (1910), pp. 619-623).—The statistics of 1909 are compared with those of previous years with reference to the destructive distillation of wood industries and their products.

Turpentine and rosin industry (*Thirteenth Census U. S.*, 10 (1910), pp. 679-694).—"This report covers the production of commercial spirits of turpentine and rosin by the distillation of the resinous exudation of the pine tree, the crude resin being derived from the longleaf pine (*Pinus palustris*), which is indigenous to a large coastal area stretching from North Carolina to eastern Texas, and, to a less extent, from the Cuban or slash pine (*P. heterophylla*), and the loblolly pine (*P. taeda*)."

The rubber and resin content of the desert rubber plant "guayule" in relation to rainfall, F. E. LLOYD (*Jour. Soc. Chem. Indus.*, 33 (1914), No. 3, pp. 107-109).—In continuation of his previous investigations (E. S. R., 25, p. 844), relative to guayule (*Parthenium argentatum*), the author here discusses the effect of varying rainfall on the rubber and resin content of the guayule plant.

From the data at hand the conclusion is reached that a relatively abundant amount of rainfall results in a plant which simulates in many ways one grown under irrigation, the likeness extending to the amount of rubber produced and the relative volumes of bearing and nonbearing tissues. Plants grown under these conditions yield a distinctly less amount of rubber than a typical desert plant. Within the normal habitat of the guayule plant the amount of rubber varies fully 62 per cent. The amount of resin secreted appears not to be affected by the amount of soil water. Evidence is yet lacking that rubber and resin secretion are casually related in the plant.

DISEASES OF PLANTS.

The enemies of cultivated plants, G. TRUFFAUT (*Les Ennemis des Plantes Cultivées. Paris, 1912, pp. 565, pls. 55, figs. 374*).—In this book the author describes the principal fungus and insect pests of plants. By means of a system of keys it is possible to recognize any pest. The keys are grouped under an alphabetical arrangement of the host plants, and the different parasites by their sequence of families. Chapters are given on methods of treatment for the prevention of attack, these including the use of fungicides and insecticides, natural methods of repression, etc. Formulas are given for the preparation of the different mixtures, and methods for their proper application are indicated.

Mildews, rusts, and smuts, G. and IVY MASSEE (*London, 1913, pp. 229, pls. 5*).—In this book the authors describe the mildews, rusts, and smuts occurring in Great Britain, and in addition they have included a number of species not yet been definitely reported in Great Britain, but parasitic on host plants indigenous to the country and also those parasitic on cultivated plants. After an introduction on the nature of the fungi, they consider the general characteristics of the different families, their relationship, the method by which fungi gain entrance into the host plant, etc., and give keys to the genera and species of the families Peronosporaceæ, Erysiphaceæ, Perisporiaceæ, Uredinaceæ, and Ustilaginaceæ.

The British rust fungi, W. B. GROVE (*Cambridge, 1913, pp. XII+412, figs. 290*).—The author presents a systematic study of the rust fungi of Great Britain, more than 250 species being included. The life history of *Puccinia caricis* is described at length as an illustration of the complexity of the group, after which chapters are given discussing the sexuality of the Uredinales, alternate generations, spore forms, grouping according to spore forms, etc. The life histories of a number of other species are described, among them *P. graminis*, *P. poarum*, *P. malvacearum*, *Gymnosporangium clavariaforme*, *Endophyllum sempervivi*, *Cronartium ribicola*, *Melampsora pinitorqua*, and *Calyptospora goeppertiana*, which represent the principal types of rust. An extended discussion of specialization and immunity is also given.

The principal portion of the work is taken up with the systematic treatment of the rusts. A considerable number of forms that are closely allied are grouped together, the author not believing in segregating species on wholly biological differences.

Notes on *Uredinopsis mirabilis* and other rusts, W. P. FRASER (*Mycologia, 6 (1914), No. 1, pp. 25-28*).—The author reports that five sowings of teliospores of *U. mirabilis* from *Onoclea sensibilis* on *Abies balsamea* were successful, as were also three sowings of æciospores on *O. sensibilis*, but infection failed with *Osmunda claytoniana*, *O. regalis*, *Aspidium thelypteris*, *Asplenium filix-femina*, and *Phegopteris dryopteris*. Teliospores of *Melampsora medusæ* from *Populus grandidentata* infected *Tsuga canadensis*, but not *Larix laricina*. Teliospores of *Pucciniastrum myrtilli* from *Gaylussacia resinosa* infected *T. canadensis*. Teliospores of *Calyptospora columnaris* from *Vaccinium pennsylvanicum* infected *Abies balsamea*. *Peridermium harknessii* failed to infect *Comandra umbellata*.

Two parasitic plants, KRÄNZLIN (*Pflanzer, 9 (1913), No. 11, pp. 556-568, pls. 3*).—This includes a description and brief account of the habits and relations of *Cassytha filiformis*, also of a *Loranthus* showing close affinities with *L. dreyei*. Removal of plants or parts attacked by these parasites is the only remedy suggested.

Plus and minus strains in the genus *Glomerella*, C. W. EDGERTON (*Abstr. in Science, n. ser., 39 (1914), No. 998, p. 258*).—In a previous publication (E. S. R.,

26, p. 645) the author called attention to what he called plus and minus strains of this fungus. These strains have been carried over for three years and are said to be still producing perithecia abundantly. That fertilization has taken place between the two strains has been proved by isolating single asci from the boundary line between the two strains and allowing them to grow into colonies. These colonies usually produce both strains.

Root knot, gall worms, and eelworms, C. FULLER (*Agr. Jour. Union So. Africa*, 6 (1913), Nos. 3, pp. 440-448, figs. 4; 5, pp. 792-802, figs. 6).—This is a brief and somewhat general account of the life history and habits of several nematodes attacking economic plants, chiefly in South Africa. Recommendations looking to the control of these pests emphasizes efforts to develop nonsusceptible strains from plants found to be already measurably resistant.

Root knot—cause and control, L. CHILDS (*Mo. Bul. Com. Hort. Cal.*, 2 (1913), No. 12, pp. 737-756, figs. 8).—This is a somewhat general account of the distribution, life history, and work of *Heterodera radiculicola*, giving a list of nearly 500 plant hosts of this nematode and discussing means of control, which include appropriate fertilization, cultivation, starvation, drought, flooding, carbon bisulphid, formaldehyde, and steam.

Nematodes attacking wood rushes in Silesia, O. OBERSTEIN (*Ztschr. Pflanzenkrank.*, 23 (1913), No. 5, pp. 262-264, figs. 2; abs. in *Internat. Inst. Agr. [Rome]*, *Mo. Bul. Agr. Intel. and Plant Diseases*, 4 (1913), No. 10, p. 1662).—The author notes the discovery by A. Lingelsheim, in the spring of 1913, of *Heterodera radiculicola* in nodules found on roots of *Scirpus sylvaticus* in the Botanical Gardens at Breslau.

[Report on plant diseases], M. T. COOK (*Ann. Rpt. N. J. Bd. Agr.*, 40 (1912), pp. 236-240).—This report deals briefly with some diseases noted in connection with vegetables, fruits, berries, ornamental trees, and flowers; and at somewhat greater length with the blister rust of white pine (*Peridermium strobi*) and the chestnut bark disease, listing several publications on plant diseases issued in 1912.

Plant diseases and pests, G. AUCHINLECK (*Imp. Dept. Agr. West Indies, Rpts. Bot. Sta. [etc.] Grenada, 1912-13*, pp. 8, 9).—Giving a brief account of insects affecting economic plants in Grenada during the past 3 years, and noting that the fungus *Sphaerostilbe* decreased greatly black blight of citrus trees due to scale insects in 1913, the author mentions also some sporadic cases of a disease of coconut, suspected to be bud rot, as observed during the past year.

Cryptogamic diseases in Hungary, B. PATER (*Ztschr. Pflanzenkrank.*, 23 (1913), No. 5, pp. 260-262; abs. in *Internat. Inst. Agr. [Rome]*, *Mo. Bul. Agr. Intel. and Plant Diseases*, 4 (1913), No. 10, pp. 1656, 1657).—The author notes briefly the appearance and relative activity in Hungary of the following organisms in 1912: *Puccinia graminis*, on rye, *P. malvacearum* on *Althea officinalis*, *P. bullata* on *Conium maculatum*, *P. menthae* on *Mentha canadensis* *piperascens*, *Epichloe typhina* on *Agropyrum repens*, *Plasmopara nivea* on *C. maculatum*, *Phoma faniculina* on fennel, and *Oidium quercinum* on oaks since 1910, old trees appearing to be immune.

Parasitic fungi observed in the vicinity of Turin in 1911, P. VOGLINO (*Ann. R. Accad. Agr. Torino*, 55 (1912), pp. 199-227).—Notes are given of a large number of fungi found parasitic on various plants and the following new species are described: *Sphaeronema parasiticum* on the leaves of *Cratagus glabra*, *Coniothyrium opuntiae* on *Opuntia ficus indica*, and *Ascochyta laricina* on larch seedlings.

Mycological notes, B. G. C. BOLLAND (*Agr. Jour. Egypt*, 3 (1913), No. 1, pp. 28-30, pl. 1).—The author gives brief descriptions of some plant diseases as noted in Egypt. Withertip of citrus fruits, particularly common on orange

trees, is described. Spraying with Bordeaux mixture, pruning, good cultivation, and proper nourishment, are insisted upon. It is stated that in Egypt wheat is attacked chiefly by *Ustilago tritici* and barley by *U. hordei* and *U. nuda*.

Plant diseases in South Africa, I. B. P. EVANS (*Agr. Jour. Union So. Africa*, 6 (1913), No. 3, pp. 449-455, figs. 3).—Besides brief notes regarding the new phytopathological laboratory at Pretoria, general mention is made of investigations in progress there. Reference is made to some diseases peculiar to the country, such as a bacterial disease of mango prevalent in the Transvaal and Natal, also to some fungi parasitic on native plants.

Plant diseases in Java, L. P. DE BUSSY (*Meded. Deli-Proefstat. Medan*, 8 (1913), No. 2, pp. 64-68, 82).—Reference herein is made chiefly to studies already reported by Honing (E. S. R., 27, p. 136) and those noted below.

Bacterial forms obtained from tobacco and other plants showing gummosis, J. A. HONING (*Meded. Deli-Proefstat. Medan*, 7 (1912), No. 6, pp. 223-253, fig. 1).—As contributory to the study of the general question whether bacterial gummosis may be ascribed to activity of forms other than *Bacillus solanacearum*, the author reports on the physiological and morphological study of a number of bacteria obtained from tobacco, etc. Of these, eleven are described as new species under the following names: *Bacterium schäffneri*, *B. zinniioides*, *B. sumatranum*, *B. aurantium-rosceum*, *B. stalactitigenes*, *B. delionse*, *B. patelliforme*, *B. rangiferinum*, *B. langkatense*, *B. medanense*, and *Corynebacterium piriforme*.

Vegetable pathology, E. JARVIS (*Ann. Rpt. Dept. Agr. and Stock [Queensland]*, 1912-13, pp. 98-100).—Along with brief notes on diseases already more or less familiar in Queensland, mention is made of a banana disease of undetermined cause said to be more severe on wet lands; some physiological abnormalities of potato; a new outbreak of *Phytophthora infestans* on tubers after immunity for a year; and a disease of cucurbitaceous plants ascribed to a *Phoma* of undetermined species.

Influence of light on infection of certain hosts by powdery mildews, G. M. REED (*Abstr. in Science, n. ser.*, 39 (1914), No. 999, pp. 294, 295).—The author reports results of investigations to determine the influence of light upon infection of hosts by powdery mildew. Seedlings of barley and wheat that had been grown in darkness until the first leaf was from 2 to 3 cm. long were inoculated with the mildew from their respective hosts. Some of the inoculated plants were kept continuously in the dark, others were removed at once and placed in the light, while still others were retained in the dark for intervals of 24 hours before being placed in the light. In general the period of incubation was retarded proportionally to the time the plant was kept in the dark. In other series of experiments the plants were first grown in the light and then after inoculation placed in the dark, some immediately, others at intervals of 24 hours.

In the case of plants placed at once in the dark no infection occurred, while those kept in the light for a day or two became infected. The period of the incubation of the fungus, however, was materially retarded. The author states that in general the effect of the absence of light on the mildew may be considered as an indirect one. Infection fails to occur in those cells which have not developed chlorophyll. This indicates that the mildew is a strict parasite attacking cells which are not capable of carrying on their normal functions.

These results are quite different from those obtained by inoculating etiolated plants with saprophytic fungi, as under such conditions the saprophytes are able to develop on the living tissues.

Investigation on foot disease of cereals, A. GUERRAPAIN and A. DEMOLON (*Betterave*, 23 (1913), Nos. 597, pp. 386-388, fig. 1; 598, pp. 402-405; 24 (1914),

No. 599, pp. 7, 8).—The results of an investigation of the disease of cereals due to *Ophiobolus graminis* and *Leptosphaeria herpotrichioides* are given, in which the influence of temperature, rainfall, soils, cultural conditions, varieties, etc., on the occurrence of the disease and results of experiments for the control of the fungi are described.

The authors claim that there are no known means for preventing the attack, but that certain factors favor or retard the development of the disease. Abnormally high winter temperatures, excessive growth of winter wheat at the beginning of the growing period, early seeding, the excessive use of nitrogenous fertilizers, susceptible varieties, and the too frequent seeding of the ground with wheat all favor the development of the fungi. Late, but not too late seeding, slow growth before winter, the avoidance of the excessive use of fertilizers and of manures containing infected straw, and the adoption of rotations in which nonsusceptible crops, such as alfalfa, are introduced, tend to reduce liability to attack and loss from this disease.

The quality of the 1913 grain for seed purposes, L. HILTNER and G. GENTNER (*Prakt. Bl. Pflanzenbau u. Schutz*, n. ser., 11 (1913), No. 12, pp. 145-148, fig. 1).—The authors state that numerous tests of seed sent from various parts of Bavaria showed for 1913 a high degree of *Fusarium* infection for wheat, oats, and rye. This is said to be more severe on the winter wheat and rye.

Smut experiments, R. E. SOUTTER (*Ann. Rpt. Dept. Agr. and Stock [Queensland]*, 1912-13, pp. 111, 112; *Queensland Agr. Jour.*, 30 (1913), Nos. 2, pp. 97-99; 3, pp. 162, 163).—These tests were carried out at the Bungeworgorai State Farm, Roma.

Of the 31 varieties of wheat tested for resistance, 26 gave from 25 to 94 per cent free from smut. The remaining 5 were entirely free from smut, one of these, Florence, being about the earliest flowering variety grown in that section. Arsenic seed treatment continued to give favorable results as regards germination, infection, and reinfection. The salt and sheep dip treatments were discontinued as being of no value.

Development of beet mildew, G. FRON (*Jour. Agr. Prat.*, n. ser., 26 (1913), No. 48, pp. 686, 687).—The author gives briefly the results of observations regarding the influence of unfavorable meteorological conditions during recent winters as related to the activity of *Peronospora schachtii*, which has inflicted serious injury in late years upon the beet crops in northern France.

Development of beet mildew in 1912-13, G. FRON (*Bul. Soc. Nat. Agr. France*, 73 (1913), No. 9, pp. 709-712).—This note, presented by Hitier, states that weather conditions described as prevalent near Montdidier during the last two years have favored the successful wintering of *Peronospora schachtii* and early and profuse distribution of its spores.

The systematic position of the organism of the common potato scab, H. T. GÜSSOW (*Science*, n. ser., 39 (1914), No. 1003, pp. 431-433).—While studying the organism that causes the scab of potatoes, an attempt was made to determine the proper name for the fungus provisionally described by Thaxter as *Oospora scabies* (E. S. R., 3, p. 772). Following international rules the author claims the name for the organism should be *Actinomyces scabies*.

Foliage resistance of different varieties of potatoes to *Phytophthora infestans*, I. E. MELHUS (*Abs. in Science*, n. ser., 39 (1914), No. 998, pp. 257, 258).—The author describes a method in which varietal resistance of potatoes to *P. infestans* was studied by artificially infecting the foliage.

The plants are grown in a greenhouse under conditions supposed to be favorable for the development of the fungus, the conidia of the fungus are germinated in water under optimum temperature conditions, and the resulting zoospores sprayed on the lower surfaces of the healthy leaves of vigorous plants from 6

to 12 in. tall. Plants thus treated are held in a moist atmosphere at 20 to 25° C. (68 to 77° F.) over night and removed the following morning.

It is believed that by this method it will be possible to learn the relative resistance of any variety of potato without growing it under field conditions.

Production of tobacco varieties resistant to slime bacteria, J. A. HONING (*Meded. Deli-Proefstat. Medan*, 8 (1913), No. 1, pp. 12-21).—In a preliminary report of further work (E. S. R., 28, p. 446), the author states that of 87 selected varieties of tobacco from Java, Cuba, Mexico, the United States, Brazil, Paraguay, Dominican Republic, the Philippines, Japan, and Hawaii all proved to be susceptible to *Bacillus solanacearum*, showing bacterial gummosis. Some Deli varieties were somewhat less affected, as appeared to be also two from the Philippines and one from Japan. These are discussed as a possible source for the development of more resistant varieties.

Tomato leaf spot, H. C. LONG (*Gard. Chron.*, 3. ser., 54 (1913), No. 1407, pp. 417, 418, fig. 1).—Reviewing briefly the history of *Septoria lycopersici*, causing leaf spot of tomatoes in England since 1907, the author approves the remedial measures recommended by Güssow (E. S. R., 20, p. 346).

A new disease of tomatoes, P. VOGLAND (*Ann. R. Accad. Agr. Torino*, 55 (1912), pp. 379-381).—The author describes *Cladosporium fulvum violaceum*, a new variety parasitic on tomato leaves. It is differentiated from the typical species mainly by the violet colored mycelium and conidiophores, characters which were maintained in cultures of the fungus.

Diseases of pear and apple trees, P. PASSY (*Jour. Soc. Nat. Hort. France*, 4. ser., 14 (1913), Dec., pp. 781, 782).—To a brief discussion of the pear disease the author adds a description of water core in apples, the glassy portions showing early attack by worms.

Treatment of chlorosis in fruit trees, G. RIVIÈRE and G. BAILHACHE (*Jour. Soc. Nat. Hort. France*, 4. ser., 14 (1913), May, pp. 287, 288).—It is stated that besides supporting conclusions from experiments previously noted (E. S. R., 27, p. 48), this study, carried out with apple and pear trees, seems to show that the favorable results observed in connection with use of iron sulphate are attributable to the metallic component of this salt, and not to the sulphuric acid.

Restoration of color to etiolated plants, L. GODDE (*Jour. Soc. Nat. Hort. France*, 4. ser., 14 (1913), May, pp. 290, 291).—Discussing some disadvantages ascribed to use of iron sulphate for chlorosis of fruit trees, etc., the author recommends a formula employing potassium sulphate, iron filings, and copper chips in the proportion of 76:6:1.

Fungus gummosis, H. S. FAWCETT (*Cal. Cult.*, 42 (1914), No. 4, pp. 99-102).—Including under the term gummosis all gumming formations and exudations of a somewhat permanent character, whether due to unfavorable climatic conditions or to parasitic invasion, the author discusses some work of other investigators on stone fruit and citrus trees, also some of his own relating more particularly to the latter.

It is stated that a bacterium (*Pseudomonas cerasus*) is at least partially responsible for cherry gummosis, which it is said may be largely prevented by budding in the limbs of Mazzard cherries as stocks, or limited by cutting out and disinfecting diseased areas. Apricot gumming receives much the same general treatment. At least five kinds of gum diseases of citrus trees are known in California (2 of which are ascribed to fungi), some account of these being given with treatments adapted to particular forms. The brown rot gummosis is ascribed to *Pythiacystis citrophthora* and the gray rot gummosis to *Botrytis vulgaris*.

A contribution to the life history and physiology of *Cylindrosporium* on stone fruits, B. B. HIGGINS (*Abs. in Science, n. ser.*, 39 (1914), No. 998, p. 258).—A study of this fungus has brought to light an interesting condition of polymorphism. Four spore forms were found to be genetically connected in the life cycle, and all of these except the microconidia, are capable of infecting the host plants.

From a study of the morphological and biological characters of the organism from eight species of *Prunus* it is found that the forms fall naturally into three species, each of which is present on one of three more or less distinct divisions of the host genus.

Some observations on the anatomy and other features of the black knot, A. STEWART (*Abs. in Science, n. ser.*, 39 (1914), No. 999, p. 291).—A description is given of the changes induced in the wood of *Prunus virginiana* by the fungus *Plowrightia morbosa*.

The normal wood of *P. virginiana* is said to contain usually rays from 1 to 4 cells wide in cross section. As a result of the stimulating action of the fungus these rays become much broader, simulating the structure of compound rays. The production of the usual elements of the xylem is greatly inhibited during the first season's growth of the knot, but there is a correspondingly great production of xylem parenchyma which is almost absent from normal wood. By a further increase in the size of the parenchyma cells the knot is greatly enlarged during the second season of its development. There is apparently no abnormal growth in the outer portion of the bark and it is sloughed off just before the conidia are produced.

Peach leaf curl, A. J. FARLEY (*New Jersey Stat. Circ.* 29, pp. 3, pls. 2).—A description is given of the peach leaf curl due to *Exoascus deformans*. For its control the author recommends a thorough spraying with concentrated lime sulphur before the buds open in the spring. Bordeaux mixture applied early in the spring before the buds start, it is said, will also control leaf curl, but the use of lime-sulphur mixture is preferred as it will control the San José scale as well as the peach leaf curl. A solution of lime sulphur of not less than 1.03 sp. gr. is recommended for use.

A disease of gooseberry new in France, E. FOEX (*Jour. Soc. Nat. Hort. France, 4. ser.*, 14 (1913), Dec., pp. 775-778; *abs. in Jour. Agr. Prat., n. ser.*, 26 (1913), No. 49, pp. 717-719).—Briefly reviewing the appearance and the history since 1900 of American gooseberry mildew (*Sphaerotheca mors-uvæ*) in the British Isles and parts of Europe, the author states that among means found effective in combating this disease are cutting and burning all affected parts, turning the soil, and spraying in autumn with 3 per cent Bordeaux mixture and in spring and summer with 0.2 or 0.3 per cent potassium sulphid.

Cacao spraying trials, G. AUCHINLECK (*Imp. Dept. Agr. West Indies, Rpts. Bot. Sta. [etc.] Grenada, 1912-13, pp. 4, 5*).—Trials made in 1912 indicated that epiphytic growths on trunks of cacao trees in wet districts could probably be prevented for some years to come by 2 or 3 applications to the bark of a solution consisting of 4 lbs. copper sulphate to 50 gal. of water. Use of Bordeaux mixture, 4:4:50, did not appear to be very profitable as used on fungus diseases in Grenada, but the experiments were to be repeated in 1913.

Review of coffee diseases in Surinam, J. KUYPER (*Dept. Landb. Suriname Bul.* 31 (1913), pp. 1-16, pls. 4).—This is a brief descriptive review of diseases affecting coffee trees in Surinam since about 1900, among which are a root disease of undetermined cause; a silver thread disease said to be identical with a disease noted in Porto Rico, but not with a thread disease somewhat similar in

Java; and several leaf diseases, each associated with *Coremium* sp., *Cercospora coffeicola*, *Mycosphaerella coffea*, *Phyllosticta coffeicola*, or *Leptosphaeria* sp.

Some cases of parasitism by higher plants and by animals are also noted.

Forest tree diseases common in California and Nevada, E. P. MEINECKE (U. S. Dept. Agr., Forest Serv., *Forest Tree Diseases Common in California and Nevada* (1914), pp. 67, pls. 24).—This manual, designed for practical use in the field, discusses some of the more important tree diseases found in California and parts of Nevada, although many of them are common in other forest regions. Its aim is to enable the field man to determine the cause of the commoner diseases and injuries and to understand their effect on the living tree. It discusses also ways and means of control of fungi and mistletoes, as well as climatic, biological, and soil conditions which contribute to diseases in forest trees.

Primitive characters recalled by the chestnut bark disease and other stimuli, I. W. BAILEY and J. S. AMES (*Abs. in Science*, n. ser., 39 (1914), No. 999, p. 290).—The authors report that the common American chestnut, when attacked by the chestnut bark disease (*Endothia parasitica*), frequently produces leaves that closely resemble those of the red oak (*Quercus rubra*). This reversion is not confined entirely to external characters, for the wood formed by the diseased cambium possesses anatomical structures which are a characteristic feature of the genus *Quercus*.

Aerial galls of the mesquite, F. D. HEALD (*Mycologia*, 6 (1914), No. 1, pp. 37, 38, fig. 1).—In this brief account of 40 inoculations of mesquite with cultures of *Bacterium tumefaciens*, the author states that 10 per cent resulted in production of galls of various sizes and forms described, while the controls showed no abnormal growth in any case. This is suspected to have a bearing upon the origin of the aerial galls common on mesquite throughout the southwest.

Bacteriosis of oleander, A. TONELLI (*Ann. R. Accad. Agr. Torino*, 55 (1912), pp. 383-400, fig. 1).—The author gives a more detailed account of his investigations on this disease, previously noted (E. S. R., 29, p. 156), and shows that it is caused by *Bacillus savastanoi* and that the infection is carried to a considerable degree by various insects.

For the control of the disease cutting out the cankers, making the cuts 5 or 6 in. below the diseased area and covering the wounds with some fungicide, are recommended. Attention also should be paid to the insect pests by which the disease is spread.

A die-back disease of Douglas spruce produced by a variety of *Sphaeropsis ellisii*, L. PETRI (*Ann. Mycol.*, 11 (1913), No. 3, pp. 278-280, figs. 3; *abs. in Internat. Inst. Agr. [Rome]*, Mo. Bul. Agr. Intel. and Plant Diseases, 4 (1913), No. 10, p. 1660).—The author reports a study made on a die-back disease of *Pseudotsuga douglasii* 5 to 7 years old growing in sandy soil at an elevation of 1,000 ft. in Tuscany. The fungus is claimed to be a variety of *S. ellisii*. The susceptibility of the trees attacked is considered to be due to the excessive moisture, insufficient light, and low temperature in this location, as trees nearby, but more favorably situated in these respects, were perfectly healthy. It is suggested that the fungus was spread from *Pinus sylvestris* in the neighborhood.

Spread of infection was prevented by spraying with 1 per cent Bordeaux mixture.

The parasitism of *Gnomonia veneta* on the sycamore, A. TONELLI (*Ann. R. Accad. Agr. Torino*, 55 (1912), pp. 401-414, figs. 2).—This article in a briefer form has been previously noted (E. S. R., 30, p. 350).

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Illustrated bird dictionary and note book: Land birds of eastern North America, C. A. REED (*Garden City, N. Y.*, [1912], pp. 110, figs. 91).—This small handbook lists the birds common to eastern North America with brief notes on their appearance, habits, nests, etc. Nearly all the common species are figured in pen and ink sketches.

Illustrated bird dictionary and note book: Water birds, game birds, and birds of prey, C. A. REED (*Garden City, N. Y.*, 1912, pp. 127, figs. 115).—This small handbook gives pen and ink sketches and descriptions of water birds, game birds, and birds of prey.

Western bird guide: Birds of the Rockies and west to the Pacific, C. A. REED, H. F. HARVEY, and R. I. BRASHER (*Garden City, N. Y.*, 1913, pp. 252, figs. 233).—This small pocket guide, illustrated in color, describes the birds of the Rockies and Pacific coast.

The birds of Kansas, C. D. BUNKER (*Kans. Univ. Sci. Bul.*, 7 (1913), No. 5, pp. 137-158).—This paper lists 379 species.

Hygrophily and phototropism in insects, F. PICARD (*Bul. Sci. France et Belg.*, 46 (1912), No. 3, pp. 235-247).—A brief discussion of the subject.

The insect enemies of cultivated plants, G. TRUFFAUT (*In Les Ennemis des Plantes Cultivées. Paris*, 1912, pp. 223-424, pls. 45, figs. 275).—Following a discussion of the measures employed in combating insect pests, brief accounts are given of the more important insect enemies of cultivated plants, arranged by orders.

[Insect pests in Nova Scotia], R. MATHESON (*Dept. Agr. Nova Scotia*, 1913, *Buls.* 3, pp. 16, figs. 3; 4, pp. 14; 5, pp. 36, pls. 2, figs. 4).—These bulletins relate respectively to the present status of the San José scale in Nova Scotia; the injurious insect, pest and plant disease act, 1911, and regulations issued thereunder; and the brown-tail and gipsy moths.

Insects of Florida: I, Diptera, C. W. JOHNSON (*Bul. Amer. Mus. Nat. Hist.*, 32 (1913), pp. 37-90).—The present paper, which lists 845 species of Diptera, supplements a list published in 1895^a which contained about 450 determined species.

[Insect pests in St. Vincent], H. A. BALLOU (*Imp. Dept. Agr. West Indies, Rpt. Agr. Dept. St. Vincent*, 1912-13, pp. 11-17).—This report is based upon investigations made from October 13 to November 1, 1913, and relates to the occurrence of insect enemies of cotton, coconuts, cacao, arrowroot, limes, peanuts, cassava, pigeon peas, etc.

Summary of entomological information in the year 1913 (*Agr. News [Barbados]*, 13 (1914), Nos. 306, p. 26; 307, p. 42; 308, p. 58).—This is a summarized account of the occurrence of insect pests of the year.

Notes on insect enemies of tropical agriculture, F. ZACHER (*Tropenpflanzer*, 17 (1913), No. 3, pp. 131-144, figs. 12).—This paper consists of miscellaneous notes on a number of pests, including crickets as enemies of *Kickxia* rubber, enemies of cotton in the Bismarck Archipelago, xylophagous enemies of cotton in Africa, tobacco pests, and a forest pest (*Sylepta* sp.) in North Togo.

Notes on the insect enemies of tropical agriculture, F. ZACHER (*Tropenpflanzer*, 17 (1913), No. 6, pp. 305-315, figs. 3).—This paper relates to the cottony cushion-scale (*Icerya purchasi*), which appears to have been collected in German Southwest Africa.

Report of the entomologist, W. H. PATTERSON (*Govt. Gold Coast, Rpt. Agr. Dept.*, 1912, pp. 22-25).—This report deals largely with the occurrence of insect pests during the year 1912.

Report of the bureau of entomology, Stavropol, for the year 1912, B. UVAROV (*Otchet Dîrûtel. Stavropol. Ent. Bûro, 1912, pp. 32, figs. 6; abs. in Rev. Appl. Ent., 1 (1913), Ser. A, No. 11, pp. 459-461*).—This report relates to the occurrence of the more important insect enemies and the work of combating them.

Seeking insects in the Orient, H. S. SMITH (*Cal. Cult., 42 (1914), No. 5, pp. 132-134*).—This is a report of observations of the occurrence of insect pests and insect parasites during the course of a trip made to the Orient with the view to discovering and introducing mealy bug parasites.

Recent importations of beneficial insects in California, E. J. VOSLER (*Mo. Bul. Com. Hort. Cal., 2 (1913), No. 12, p. 770*).—*Lecaniobius cockerelli*, an egg parasite of the black scale, is said to have been imported from the West Indies; several hymenopterous parasites of mealy bugs from Japan; a parasite of the red scale and a pteromalid egg parasite of the black scale from the Philippines; and parasites of the black scale from Peru.

Insect pests of the potato, C. FRENCH, JR. (In *Handbook of Fungus Diseases of the Potato in Australia and Their Treatment. Melbourne, 1911, pp. 212F-212U, figs. 14; Jour. Dept. Agr. Victoria, 11 (1913), No. 12, pp. 729-748, figs. 14*).—This summarized account of the important insect enemies of the potato in Australia appeared as an appendix to the work by D. McAlpine, previously noted (*E. S. R., 30, p. 48*).

It is stated that the native insects whose natural food is being destroyed as new land is being brought under cultivation are turning their attention to the potato and other crops. Among the several more important species mentioned are *Thrips tabaci*, several species of cutworms and looper caterpillars, the potato moth (*Lita solanella*), the potato and tomato weevil (*Desiantha nociva*), wireworms, etc.

Insect pests of paddy in southern India, T. B. FLETCHER (*Dept. Agr. Madras Bul. 67 (1913), pp. 9, pls. 2, figs. 10*).—Twenty-six different pests are noted.

Insects attacking apple, pear, plum, and cherry trees, G. F. WILSON (*London: Roy. Hort. Soc., 1913, pp. 44-72*).—Brief descriptions are given of the more important insect enemies of these trees.

Some insect enemies of the tea plant, C. BERNARD (*Dept. Landb. Nijv. en Handel [Dutch East Indies], Meded. Proefstat. Thee, No. 17 (1912), pp. 21-35, pls. 3*).—The pests here considered are two scales of the family Lecanidinae *Heliothrips hæmorrhoidalis*, *Stauropus alternus*, etc.

Insects on rubber in 1913, A. RUTHERFORD (*Trop. Agr. [Ceylon], 42 (1914), No. 1, pp. 41-44*).—A brief discussion of the more important insect enemies of rubber.

Studies of acute epidemic poliomyelitis, C. KLING and C. LEVADITI (*Ann. Inst. Pasteur, 27 (1913), Nos. 9, pp. 718-749; 10, pp. 839-854, pl. 1, fig. 1; abs. in Rev. Appl. Ent., 1 (1913), Ser. B, No. 11, pp. 216-218*).—In discussing the methods by which this disease may be transmitted in nature a number of pages are devoted to a consideration of the possible transmission of the virus by insects.

Economic importance of the family Sminthuridæ, with notes on an attack of *Bourletiella hortensis* on soy beans, G. H. CORBETT (*Agr. Students' Gaz., n. ser., 16 (1913), No. 4, pp. 128-130, figs. 2*).—*B. hortensis* attacks the under-surface of the cotyledons of soy beans near the edge, where it eats out crescent-shaped holes; it also eats small holes in the upper surface of the seed leaves. Some plants are said to suffer to such an extent that they die. The damage of principal importance is done while the plants are in the seed leaf stage.

On some timbers which resist the attack of termites, KANEHIRA (*Indian Forester*, 40 (1914), No. 1, pp. 23-41).—The author concludes that the factors which make timber termite-proof are the presence in the wood of some substance which has a strong repellant smell or taste; the presence of substances which are poisonous; and extreme hardness.

Combating the locust in the government of Stavropol during the years 1907 to 1912, B. UVAROV (*Bor'ba s Saranchevymi v Stavropol'skoi Gubernii v 1907-1912*. St. Petersburg: Dept. Zeml. Stavropol. Ent. Büro, 1913, pp. 87, pls. 12).—A detailed account of the control measures for locusts, particularly *Stauronotus maroccanus*, employed in Stavropol.

A contribution to the life history and habits of the brown locust (*Die-strammema marmorata*), a greenhouse pest, HERRMANN (*Gartenwelt*, 18 (1914), No. 7, pp. 92-94, fig. 1).—A brief account of this locust as a pest in Silesia, Germany, and the means of combating it.

Froghoppers, J. C. KERSHAW (*Dept. Agr. Trinidad and Tobago*, 1913, *Spec. Circs.* 4, pp. 3; 5, pp. 6, pl. 1; 6, pp. 7, pls. 2; 7, pp. 4).—The data presented in these circulars have been previously noted from another source (*E. S. R.*, 30, p. 250).

A contribution to the biology of the Coccinellidæ, A. OGLOBLIN (*Russ. Ent. Obozr.*, 13 (1913), No. 1, pp. 27-43, figs. 10).—This paper, which deals with a number of species of lady beetles, includes an account of the biology of two of their parasitic enemies, namely, *Dinocampus terminatus* and *Tetrastichus coccinellæ*.

African scale insects, L. LINDINGER (*Jahrb. Hamburg. Wiss. Anst.*, 30 (1912), *Beiheft* 3, pp. 59-100, figs. 9).—This fifth paper deals with the scale insects of German East Africa. See also a previous note (*E. S. R.*, 27, p. 358.)

The Cyrus Thomas collection of Aphididæ, and a tabulation of species mentioned and described in his publications, J. J. DAVIS (*Bul. Ill. State Lab. Nat. Hist.*, 10 (1913), Art. 2, pp. 97-121, pls. 2).—The collection of aphids here considered consists of 73 slides and 176 vials, all of which are in the custody of the Illinois State Laboratory of Natural History. Only species with labels bearing data other than numbers have been determined and are here reported upon.

Notes on European species of the genus *Aphelinus* parasitic upon the plant lice, N. B. KURDJUMOV (*Russ. Ent. Obozr.*, 13 (1913), No. 2, pp. 266-270).—This paper includes a synoptic table of European species of *Aphelinus* with hairy eyes, and descriptions of four species new to science, two of which were reared from *Toxoptera graminum* at the Poltava Experiment Station.

A partial key to the genera of North American Jassoidea, S. E. CRUMB (*Trans. Kans. Acad. Sci.*, 26 (1912), pp. 129-137, figs. 24).—A table is given for the separation of the families of Jassoidea, except Typhlocybidæ; of the subfamilies, except Athysaninæ; and of the genera.

The known species of Japanese Chrysopidæ, H. OKAMOTO (*Trans. Sapporo Nat. Hist. Soc.*, 5 (1913), No. 1, pp. 49-60).—Twelve species of *Chrysopa* are recognized. A bibliography is appended.

Studies on the Mecoptera of Japan, T. MIYAKÉ (*Jour. Col. Agr. Imp. Univ. Tokyo*, 4 (1913), No. 6, pp. 265-400, pls. 10, figs. 6).—A structural and systematic study. Forty species are recorded of which four are new to science. A bibliography of 43 titles is appended.

The Bombidæ of the New World, H. J. FRANKLIN (*Abs. in Canad. Ent.*, 46 (1914), No. 2, pp. 73-76).—This is a review by F. W. L. Sladen of the work previously noted (*E. S. R.*, 30, p. 59).

Carpocapsa pomonella; results of investigations by the Experiment Station of Poltava, I. V. NIKITIN (*Trudy Poltav. Selsk. Khoz. Opytn. Stantsii*, No.

16 (1913), pp. XIII+74, figs. 11; abs. in *Rev. Appl. Ent.*, 1 (1913), Ser. A, No. 10, pp. 364-367).—The first part of the report, devoted to the biology of the codling moth in the government of Poltava, is followed by a discussion of the literature and experiments with the driving spray method. A number of parasites were reared from the larvæ.

The occurrence of the codling moth in Turkestan and the methods employed in combating it, A. F. RADETSKY (*Turkest. Ent. Stanitsia*, 1913, pp. 52, figs. 8; abs. in *Rev. Appl. Ent.*, 1 (1913), Ser. A, No. 10, pp. 367-370).—The codling moth is the most serious insect pest occurring in Russian Turkestan. The small number of parasites attacking it in Turkestan tends to support the view that it has been only recently imported. It is stated that in 1912 *Asco-gaster canifrons* was found infesting 15 per cent of the caterpillars, appearing chiefly in the gardens near Tashkend, its numbers diminishing gradually in proportion to the distance from the town, whereas in the previous year less than 2 per cent of the caterpillars were infested. "In the northern Provinces of Russia there is only one brood of *Laspeyresia pomonella* in the year; in middle and south Russia, two more or less complete broods; while in Russian Turkestan there are three, two complete and one more or less partial, though considerable."

On Escherich's discussion of my work on the wilt disease of the gipsy moth (*Liparis dispar*), W. REIFF (*Naturw. Ztschr. Forst u. Landw.*, 11 (1913), No. 1, pp. 49-54).—A discussion of Escherich's^a review of the work previously noted (*E. S. R.*, 27, p. 659).

Hyponomeuta malinellus, its bionomics and methods of combating it, S. A. MOKRZECKI (*Abs. in Rev. Appl. Ent.*, 1 (1913), Ser. A, No. 9, pp. 345-349).—This moth is said to be found everywhere in Russia; while it is not a serious pest in the northern and western Provinces it is a source of very serious injury in the southern and southeastern Provinces. The paper includes a discussion of its natural enemies and means of combating them.

"Barium chlorid when used in 1 per cent or 2 per cent solution (4½ to 6 lbs. of barium in about 27 to 30 gal. of water) is considered to be the most effective. One of its disadvantages is the want of adhesiveness, to obtain which it is recommended by some authors to add potato sirup or a solution of resin in 90 per cent spirit; while the author recommends the addition of soda (about ¼ lb. for the above quantity). The latter transforms some of the barium into BaCO₃, but in his opinion the amount of barium lost in this way is not important, besides it gives the solution a white color, thus facilitating control of the spraying. Another disadvantage is that it burns the leaves of the trees; this, although very serious, can be minimized by careful and rapid spraying. The author states that during 8 years' use of this insecticide under his direction there never was a case of poisoning either of the cattle feeding on the sprinkled grass or of birds."

Nun moth problems, K. ESCHERICH (*Naturw. Ztschr. Forst u. Landw.*, 10 (1912), No. 2, pp. 65-85).—The subjects discussed in this article include investigations of the value of adhesive bands in combating the nun moth; the number of pine needles consumed by nun moth caterpillars; the food of young caterpillars on pine; the resistance of young caterpillars to cold; the importance of aerostatic hairs of young caterpillars; and nonviable eggs.

"The pink boll worm" (*Gelechia gossypiella*), G. C. DUDGEON (*Agr. Jour. Egypt*, 2 (1913), No. 2, pp. 45-48, pl. 1).—This article relates to *G. gossypiella*, the occurrence of which in Egypt appears to have been overlooked by writers previous to 1911, although specimens have been found commonly in damaged cotton bolls throughout the country for many years.

^a *Naturw. Ztschr. Forst u. Landw.*, 10 (1912), No. 2-3, p. 84.

Phalera bucephala and its importance for the artificial breeding of *Pentarthron* (*Oophthora*) *semlidis* in winter, I. A. PORTCHINSKY (*Trudy Būro Ent. [St. Petersburg.], 10 (1913), No. 4, pp. 16, figs. 8; abs. in Rev. Appl. Ent., 1 (1913), Ser. A, No. 9, pp. 317, 318*).—The author suggests that pupæ of insects hibernating in the pupal stage, such as *P. bucephala*, a moth widely distributed in Russia, or as *P. bucephaloides*, may be used in rearing the chalcidid parasite *Pentarthron semlidis* during the winter for use in combating *Euxoa* (*Agrotis*) *segetum*.

The vine-flower gall midge (*Contarinia viticola*) (*Luxemb. Weinztg., 1 (1913), No. 21, pp. 357, 358; abs. in Rev. Appl. Ent., 1 (1913), Ser. A, No. 9, p. 331*).—This gall midge is said to have occurred in large numbers in vineyards at Schwebsingen (Luxemburg), the damage in 1913 being estimated at one-tenth of the crop.

On certain hematophagous species of the genus *Musca*, with descriptions of two new species, W. S. PATTON and F. W. CRAGG (*Indian Jour. Med. Research, 11 (1913), No. 1, pp. 11–25, pls. 5; abs. in Rev. Appl. Ent., 1 (1913), Ser. B, No. 1, pp. 209, 210*).—It is pointed out that in the genus *Musca*, in which the proboscis is of the type from which the muscid biting flies have evolved, there are certain flies that habitually feed on blood. Though they are confirmed bloodsuckers and have no other food, the proboscis is not adapted for piercing and presents no notable deviations from the type of the genus. "Totally unable to penetrate the skin of the host themselves, they rely on other and better equipped flies to do it for them and feed on the blood and serum which exudes from their bites. For this purpose they associate themselves with the biting muscids, such as *Stomoxys*, *Bdellolarynx*, *Philæatomyia*, and *Lyperosia*, and with the *Tabanidæ*."

The practical importance of this group lies in their probable capacity to transmit disease from one animal to another. Four species studied by the authors in South India, all of which resemble the common house fly superficially, are described, two being new to science.

The migratory habit of house fly larvæ as indicating a favorable remedial measure.—An account of progress, R. H. HUTCHISON (*U. S. Dept. Agr. Bul. 14 (1914), pp. 11*).—"Observations and experiments show that the migratory habit is deeply ingrained and highly characteristic of house fly larvæ. The migratory habit appears in the prepupal stage in response to various internal and external stimuli. Of the external stimuli, moisture is perhaps the most important in determining the direction of their travels and the choice of a place for pupation. The migratory habit is an adaptation of great advantage in that it insures to the issuing adult the easiest and quickest escape. The deep-seated habit offers an important point of attack in the attempt to control the pest.

"Experiments with maggot traps show that 98 or 99 per cent of the total number of larvæ can be made to leave the manure, provided it is kept moist. Even from comparatively dry manure as many as 70 per cent can be destroyed. The development of the maggot trap into an efficient weapon in the warfare against the house fly involves the working out of certain practical points, namely, the size and structure of the trap, the time necessary to keep the manure in the trap to rid it of maggots, the disposal of the larvæ, etc."

A list of 9 references to the literature is appended.

Further reports on flies as carriers of infection (*Rpts. Local Govt. Bd. [Gt. Brit.], Pub. Health and Med. Subjs., n. ser., Nos. 66 (1912), pp. 22, pls. 2; 85 (1913), pp. 46, pl. 1, figs. 13*).—Three papers are presented in the fifth of these reports (*E. S. R., 30, p. 658*), namely, *Observations on the Range of Flight of Flies*, by C. G. Hewitt (pp. 1–5); *British Flies which Cause Myiasis in Man*, by E. E. Austen (pp. 5–15); and *An Account of the Bionomics and the Larvæ*

of the Flies *Fannia* (*Homalomyia*) *canicularis* and *F. scalaris* and Their Relation to Myiasis of the Intestinal and Urinary Tracts, by C. G. Hewitt (pp. 15-22). The five papers presented in the sixth report are: *Empusa muscæ* and the Extermination of the House Fly, by H. T. Glissow (pp. 10-14); Hibernation of House Flies, by S. M. Copeman (pp. 14-19); The Range of Flight of *Musca domestica*, by G. H. F. Nuttall, E. Hindle, and G. Merriman (pp. 20-41); Note on the Color Preference of Flies, by E. Hindle (pp. 41-43); and Further Observations on Nonlactose-fermenting Bacilli in Flies, and the Sources from Which They Are Derived, with Special Reference to Morgan's Bacillus, by G. S. Graham-Smith (pp. 43-46).

A new parasite of the house fly (Acarina, Gamasoidea), H. E. EWING (*Ent. News*, 24 (1913), No. 10, pp. 452-456, pl. 1).—*Macrocheles muscæ* n. sp., collected at Ithaca, N. Y., and Corvallis, Oreg., is said to be a true parasite of *Musca domestica*.

Formaldehyde gas not effective upon flies, E. S. TUCKER (*Trans. Kans. Acad. Sci.*, 26 (1912), p. 53).—Formaldehyde gas, generated by 2 lbs. of formalin and $\frac{1}{2}$ lb. of permanganate of potash crystals, in the disinfection of a room containing 1,456 cu. ft. of space, is reported to have had no ill effect upon house flies which were confined in the fumes over night.

The large narcissus bulb fly (*Merodon equestris*), L. CHILDS (*Mo. Bul. Com. Hort. Cal.*, 3 (1914), No. 2, pp. 73-76, figs. 2).—This syrphid pest is said to have frequently been received from Sutter County, Cal., and to have been taken at San Rafael, Cal., where it is reported to live in the bulbs of *Amaryllis*.

Results of work in combating the olive fly in 1912, A. BERLESE (*Bol. Min. Agr., Indus. e Com.* [Rome], Ser. C, 12 (1913), No. 5-7, pp. 7-16).—A summary of the results of the year.

The peach fly, J. C. CASTELLANO (*Gac. Rural* [Buenos Aires], 6 (1913), p. 783; abs. in *Rev. Appl. Ent.*, 1 (1913), Ser. A, No. 9, pp. 310, 311).—The author reports that the peach fly (*Chyliza persicorum*) is the source of much injury to fruit crops in Argentina. It generally appears at the end of February and during March, finding conditions favorable to its development in windfalls or stacked fruit, especially those which have suffered slight damage and present cracks and bruises and where the eggs can be deposited.

Researches on the larval morphology of Diptera of the genus *Phora*, D. KEILIN (*Bul. Sci. France et Belg.*, 45 (1911), No. 1, pp. 27-88, pls. 4, figs. 5).—This detailed report of the author's studies includes work with *Phora bergensstammi*, *P. rufipes*, *P. ruficornis*, etc., and a review of the literature. A bibliography of 39 titles is appended.

The bionomics of the rat flea, C. STRICKLAND (*Brit. Med. Jour.*, No. 2735 (1913), p. 1160).—These notes relate to the longevity of the adult *Ceratophyllus fasciatus*.

On "Crithidia" fasciculata in hibernating mosquitoes (*Culex pipiens*) and the question of the connection of this parasite with a trypanosome, H. M. Woodcock (*Zool. Anz.*, 43 (1914), No. 8, pp. 370-382, figs. 41).—Whether or not this parasite is connected with the trypanosome still remains to be determined.

The boll weevil, G. H. ALFORD (*Chicago* [1914], pp. 31, figs. 18).—A summarized account of the boll weevil and the means by which cotton may be profitably produced in infested territory.

New bark beetles and food plants, Y. NIISIMA (*Trans. Sapporo Nat. Hist. Soc.*, 5 (1913), No. 1, pp. 1-6).—A number of species of scolytids representing the genera *Hylesinus*, *Polygraphus*, and *Cryphalus* are described as new.

The Meloidæ of Mexico, L. CONRADT (*Bol. Dir. Gen. Agr.* [Mexico], *Rev. Agr.*, 2 (1912), No. 7, pp. 644-649, pls. 2).—A general account of the blister beetles is followed by brief descriptions of nine species found in Mexico.

A new strawberry pest: The metallic flea beetle (*Haltica pagana*), C. FRENCH, Jr. (*Jour. Dept. Agr. Victoria*, 11 (1913), No. 10, p. 591).—The author reports that complaints were received from strawberry growers in the districts of Wandin and Evelyn, Victoria, of depredations by the metallic flea beetle, a native insect.

A preliminary report on the sugar beet wireworm, J. E. GRAF (*U. S. Dept. Agr., Bur. Ent. Bul.* 123 (1914), pp. 68, pls. 23, figs. 9).—This, a report of studies of *Limonijs californicus* carried on since 1909, describes the manner of injury, the history of the species, the insects associated with it in the destruction of the beet roots in different stages of growth, the number of its food plants, its life history and habits, suggestions as to the methods for its control, etc.

This wireworm has been known in the coast lowlands of southern California for many years, having been more or less destructive to sugar beets during the time they have been grown there, and prior to that time was known as an alfalfa and corn pest, and had caused serious losses in many localities. The Lima bean loss which it occasioned in 1912 is estimated at \$10,000. The sugar beet is killed through the injury to the roots, the wireworm being most injurious while the beets are young. Other wireworms mentioned as associated with it include *Drasterius livens*, *Cardiophorus aeneus*, *C. crinitus*, etc.

This sugar beet wireworm was found quite generally throughout the western half of California, being abundant in the lower sugar beet lands of southern California. The main districts affected by it are those of Ventura, Orange, and Los Angeles counties, which comprise probably the choicest sugar beet land in southern California. A single specimen is said to have been collected in eastern Washington. The other food plants listed are wild beet (*Beta* sp.), potato (*Solanum tuberosum*), corn (all varieties), Johnson grass (*Sorghum halepense*), dock (*Rumex hymenosepalus*), pigweed (*Amaranthus retroflexus*), chrysanthemum, nettle, wild aster, and mustard (*Brassica niger*).

"The life cycle probably covers 4 years. About 1 month each is required for the egg and pupal stages; 7 to 9 months for the adult stage, during the greater part of which the beetle is in hibernation; and about 3 years, or the rest of the time, for the larval stage. Thus far it seems to be impractical to employ remedies against the larvæ. As these live underground and are protected by a thick integument it is difficult to injure them. They also seem able to eat a certain quantity of many poisons and deterrent substances with safety. Plowing in the fall is a fair remedy against the pupæ, but at that time of the year the soil is dry in southern California and is turned up in large clods; consequently many pupæ escape destruction. Much of the injury to the beets may be avoided by early planting, thus giving the roots a good start before the wireworms are doing their most extensive feeding. Clean culture against the adults, by compelling them to seek shelter elsewhere and exposing them to the attacks of their bird enemies, seems to be the most practical remedy found thus far for this insect. The efficiency of this remedy would be increased if fall plowing and early planting were used with it."

Descriptions of thirteen new species of parasitic Hymenoptera and a table to certain species of the genus *Ecphylys*, S. A. ROHWER (*Proc. U. S. Nat. Mus.*, 45 (1913), pp. 533-540).—Several of the species here described are of economic importance.

A new aphid feeding braconid, N. KURDJUMOV (*Russ. Ent. Obozr.*, 13 (1913), No. 1, pp. 25, 26, fig. 1).—*Diaretus* (*Aphidius*) *obsoletus*, the species here described as new, is an important parasite of two injurious grain aphids, *Brachycolus noxius* and *Toxoptera graminum*.

The larval forms and biology of an entomophagous cynipid (*Eucoila keilini*), D. KEILIN and G. DE LA BAUME PLUVINEL (*Bul. Sci. France et Belg.*

47 (1913), No. 1, pp. 88-104, pls. 2, figs. 5).—This paper relates to *E. keilini*, a parasite which develops in the general cavity of the larva of *Pegomya winthemi*. It is quite remarkable because of the many larval forms.

A systematic monograph of the chalcidoid Hymenoptera of the subfamily Signiphorinae, A. A. GIRAULT (*Proc. U. S. Nat. Mus.*, 45 (1913), pp. 189-233).—This monograph includes a table for the separation of species of the genus Signiphora, a table of the host relations of the Signiphorinae, and descriptions of 27 species of which 14 are new to science. The species of this subfamily are parasites of scale insects.

An annotated bibliography of 9 titles is appended.

Notes on the chalcidoid Hymenoptera of the family Trichogrammatidae, with description of a new subgenus from Australia, A. A. GIRAULT (*Russ. Ent. Obozr.*, 13 (1913), No. 2, pp. 292-294; *abs. in Rev. Appl. Ent.*, 1 (1913), Ser. A, No. 11, pp. 435, 436).—This paper includes notes on 6 species of parasites of the genus Trichogramma, most of which are of considerable economic importance.

South African "fertile" worker-bees, G. W. ONIONS (*Agr. Jour. Union So. Africa*, 7 (1914), No. 1, pp. 44-46).—In continuation of the article previously noted (*E. S. R.*, 27, p. 865).

On the etiology of foul brood in bees, I. L. SERBINOV (*Selsk. Khoz. i L'sov.*, 242 (1913), July, pp. 367-382; *abs. in Rev. Appl. Ent.*, 1 (1913), Ser. A, No. 11, pp. 441-446).—A report of studies. See also a previous note (*E. S. R.*, 30, p. 161).

Second annual report of the state bee inspector to the governor of the State of Iowa for the year 1913, F. C. PELLETT (*Ann. Rpt. State Bee Insp. Iowa*, 2 (1913), pp. 72, pls. 2, fig. 1).—This report of the work accomplished during the year, particularly as relates to bee diseases, is followed by a number of papers by different authors giving information of value to bee keepers.

Bee keeping industry in Germany, H. L. SPAHR (*Daily Cons. and Trade Rpts. [U. S.]*, 17 (1914), No. 44, p. 717).—"At the end of 1912 there were counted 2,619,891 beehives in Germany, over half of these being in Prussia. Silesia leads the Prussian Provinces with 187,264, and of all the non-Prussian States only Bavaria has more (over 400,000). The Province of Posen counted 122,705."

Synoptic list of ants reported from the Hawaiian Islands, LOUISE GULICK (*Proc. Hawaii. Ent. Soc.*, 2 (1913), No. 5, pp. 306-311).—This is a composite key for the determination of Hawaiian ants, with the collections in which specimens are to be found, and the publications in which the various species are reported from Hawaii.

Injury caused by ants to tobacco, A. SPLENDORE (*Bol. Tec. Cultiv. Tabacchi [Scafati]*, 11 (1912), No. 5, pp. 251-254, pl. 1, fig. 1).—*Messor barbarus*, *Tetramorium coespitum*, and *Formica fusca cinerica* are described as enemies of tobacco.

Annotated list of the Diplopoda and Chilopoda, with a key to the Myriapoda of Kansas, H. GUNTHERP (*Kans. Univ. Sci. Bul.*, 7 (1913), No. 6, pp. 161-182, pl. 1).—This paper includes a bibliography on the Myriapoda consisting of 195 titles.

The rabbit coccidiid *Eimeria stiedæ* with a contribution to the knowledge of *E. falciformis*, F. REICH (*Arch. Protistenk.*, 23 (1912), No. 1, pp. 1-42, pls. 4, figs. 13).—A detailed report of biological studies of these protozoan parasites. A bibliography of 63 titles is appended.

Red spider spread by winds, H. P. STABLER (*Mo. Bul. Com. Hort. Cal.*, 2 (1913), No. 12, pp. 777-780, figs. 2).—Investigations made in California are said

to establish the fact that the red spider is blown sufficient distances by the wind to make an infested orchard a menace to orchards within a reasonable distance. Experiments are briefly reported.

Rocky Mountain spotted fever.—A report of its investigation and of work in tick eradication for its control during 1913, L. D. ERICKS (*Pub. Health Rpts. [U. S.], 29 (1914), No. 8, pp. 449-461*).—The author reports upon tick eradication, particularly as relates to domestic animals, including the construction of dipping vats; and also upon the destruction of wild animals, tick surveys, sheep grazing, and the investigation of the geographical distribution of Rocky Mountain spotted fever.

FOODS—HUMAN NUTRITION.

The milling quality of Marquis wheat, C. H. BAILEY (*Minnesota Sta. Bul. 137 (1914), pp. 9-14, fig. 1*).—Comparison was made of the yield of flour, protein content, and bread making quality of middlings flour from samples of Fife, Bluestem, and Marquis wheat grown in the same locality.

The conclusion is reached that "the Marquis wheat samples tested were slightly superior in most respects to the Fife and Bluestem samples raised under the same conditions. A higher yield of total flour was obtained from the Marquis samples and the high-grade or 'middlings flour' contained a higher percentage of protein, absorbed more water in making the dough, and produced loaves of somewhat greater volume. There was comparatively little difference in the color of flour obtained from the two groups of wheat."

The soy bean and its use as a foodstuff (*Konserv. Ztg., 14 (1913), No. 48, pp. 377, 378*).—A brief account of the history, nutritive value, and utilization of the soy bean.

Graphic representation of the value of milk, A. J. J. VANDEVELDE (*Bul. Soc. Chim. Belg., 27 (1913), No. 11, pp. 287-295, figs. 3*).—Believing that the dangers of adulterated milk can be best brought home to the public by graphic representations, the author has worked out and here publishes the mathematical formulas for constructing circular diagrams in which the nutrients and adulterants of milk may be strikingly shown.

Report to the local government board upon the available data in regard to the value of boiled milk as a food for infants and young animals, JANET E. LANE-CLAYTON (*Rpts. Local Govt. Bd. [Gt. Brit.], Pub. Health and Med. Subjs., n. ser., No. 63 (1912), pp. 60, figs. 5*).—This report includes an exhaustive summary of the reliable investigations into the relative values of human and other milks, both raw and boiled, for infant feeding, and also detailed reference to a research carried on by Ballin with healthy babies at the Infant Consultation of the Naunyn Strasse in Berlin. Numerous statistics of growth and similar data are given in connection with the Berlin work. The author's summary and conclusions, based on both experimental and clinical data, are as follows:

"There is apparently no serious loss of nutritive value produced by feeding an animal upon boiled milk derived from an animal of the same species. At the same time it must be pointed out that the published evidence on this point is scanty.

"When an animal is fed upon the milk of another species, the milk from which has been found to be suitable for this purpose, such small differences as have been found in the nutritive values of raw and boiled milk have been in favor of boiled milk.

"The milk of the same species has a considerably higher nutritive value for that species than the milk of any other species so far investigated.

"The evidence dealt with throughout this report emphasizes very forcibly the importance of breast feeding for the young of all species and shows the special importance of breast feeding during the early weeks of life.

"Where artificial feeding has been employed in animal experiments, boiled milk of a foreign species has given more satisfactory results than similar milk raw. The Berlin figures dealing with infants fed on boiled cow's milk, give extremely favorable results, and in view of the evidence collected in this report could scarcely be expected to be surpassed had raw cow's milk been used.

"It may be . . . pointed out that the Berlin babies who are artificially fed in connection with the Consultation receive milk of a known excellent quality. The excellence of the results obtained in Berlin are almost certainly largely due to the care and supervision exercised at and through the Consultation."

An extensive bibliography is appended.

The composition of carabao's milk, E. R. DOVEY (*Philippine Jour. Sci., Sect. A*, 8 (1913), No. 3, pp. 151-157).—This study gives detailed analyses of the milk of the carabao, which is described as "with the possible exception of goat's milk, . . . the principal native dairy product in the Philippine Islands." The composition of cheese made from it is also given.

Contribution to the study of "black spots" in frozen meat, M. MÜLLER (*Ztschr. Fleisch u. Milchhyg.*, 24 (1913), No. 5, pp. 97, 98, figs. 2).—The material here described was Norwegian reindeer meat, the mold producing the spots being the same as that found in other frozen meats in England and elsewhere, *Cladosporium herbarum*. References are given to the literature of the subject.

The sandwich and its significance in popular diet, M. RUBNER and SCHULZE (*Arch. Hyg.*, 81 (1913), No. 4-5, pp. 260-271).—In Germany the custom of buying bread spread with butter and some meat preparation to make up the entire meal has become so common among working people in the cities that a systematic study of such sandwiches seemed to the authors desirable. They give analyses and data as to the relative cost of nutrients and energy from sandwiches of different types purchased in the open market, and conclude that these articles provide nutrients in a relatively expensive form. Their use is especially condemned in cases where buying them precludes all use of hot meat at other meals or of a hot beverage with the sandwich.

The significance of finely divided vegetable foods in the economy of the body—a contribution to the study of cellulose digestion, F. W. STRAUCH (*Ztschr. Expt. Path. u. Ther.*, 14 (1913), No. 3, pp. 462-479).—In the extensive digestion experiments on which the author's statements are based the digestibility of fresh vegetables (string beans, green peas, spinach, carrots, and savoy cabbage) prepared in the usual way is compared with that of the same materials reduced to powdered form and then cooked.

Although the relative nutritive values of the ordinary and powdered forms differed somewhat in the various kinds of vegetables used, the coefficients of digestibility of protein and energy from the powdered material were in all cases higher than those from the ordinary preparations. Especially noticeable was the increased resorption of cellulose from the powdered vegetables. It was found possible to include in the daily diet 300 gm. of the dried powders, a much greater amount of the vegetables than could be consumed if taken in the usual way. This is considered of importance for certain dietary regimens, as is also the further fact that even when taken in large quantities or by patients suffering from enteritis, abdominal typhus, fermentative dyspepsia, etc., the cellulose in the powdered vegetables appeared not to irritate the intestinal mucus.

A copper balance on 7 experimental subjects to determine the effect of eating coppered vegetables, C. L. A. SCHMIDT (*Jour. Amer. Chem. Soc.*, 36

(1914), No. 1, pp. 132-136).—The author reports in detail the results of experiments undertaken for Taylor's investigation of the action of coppered vegetables on the health and nutrition of man (E. S. R., 29, p. 762).

When coppered vegetables formed a part of the experimental diet, a distinct retention of copper was noted. "In order to obtain a true balance, an allowance must be made for copper normally ingested in foods. This value can be obtained by assuming that the output of copper in the foreperiod represents the copper ingested during that time. The copper so retained in the body will probably be only slowly eliminated."

Better coffee making—recommendations for dealers and consumers resulting from exhaustive studies which disclosed the importance of fine granulation and the high efficiency of the filtration method, E. ABOEN (*Tea and Coffee Trade Jour.*, 25 (1913), No. 6, pp. 568-574, fig. 1).—This paper, read before the convention of the National Coffee Roasters' Association, November, 1913, discusses the general subject of coffee brewing with special reference to the results of the analysis of coffee infusions prepared by different methods.

Stress is laid on the importance of fresh granulation and accurate methods of measuring materials and temperatures. A mixture of Bogota and Santos coffee, medium roast, in both medium ground and pulverized form, was used in the experiments. Seven tablespoons of coffee (80 gm. of medium and 82 gm. of pulverized coffee) were used to 6 cups of water (750 cc.), which is the usual household allowance. The coffee was prepared in four different ways, namely, boiling, steeping, percolating, and filtration.

Boiled coffee was made by placing medium ground material in cold water, heating it to the boiling point at which it was maintained for 5 minutes, and then adding a little cold water to cause the grounds to settle. Steeped coffee was made in the same way, except that it was settled and poured off directly the boiling point was reached. Finely ground coffee was used for the percolated preparations and the directions provided by the manufacturers of the percolators were followed. Filtered coffee was prepared from finely powdered coffee berries inclosed in a muslin bag over which vigorously boiling water was poured.

The amounts of total solids, tannin, and caffeine in coffee by each method were carefully determined. It was found that the general strength of the brew (amount of total solids present) depended rather on the fineness of granulation than on the length of time which the coffee and water were cooked together. Lengthening the cooking period (as in boiling or percolating) tended to extract more tannin in proportion to caffeine and other bodies on which the desirable flavor seems to depend. In percolators, water far below the boiling point in temperature is sprayed for a considerable period over the coffee, with the result that the flavor is not well extracted though the tannin is, a fact, according to the author, contrary to the claims of many manufacturers. On the whole, filtration was found to produce coffee giving best results as regards both flavor and low tannin content.

The amounts of tannin found in a cup of the various infusions were as follows: Boiled, 2.44 grains; steeped, 2.40 grains; percolated, 2.21 to 2.90 grains; filtered, 0.20 to 0.25 grain. The amounts of caffeine are: Boiled, 2.50 grains; steeped (medium ground), 0.75 grain; steeped (finely ground), 1.75 grains; percolated, 2.75 grains; filtered, 2.50 grains.

The author makes several practical deductions, as follows:

"The use of eggs to settle the coffee is common to boiling and steeping recipes. The effect of the egg . . . is to poach the grounds, which, thus weighted, sink to the bottom. . . . The liquor can be better cleared by straining off and the egg adds a foreign matter to the coffee which is no improvement to flavor. . . .

"The filtration method is the process of relating, in the most efficient way, coffee in its most efficient brewing state, viz, pulverized, to water at its most efficient brewing temperature, boiling. . . . It develops the distinctive characters of various coffees clearly and has a purity to the taste which is strikingly confirmed by the purity shown in the chemical analysis. In using this method emphasis must be placed upon the fact that boiling water, at the full boiling point, 212°, and pulverized coffee are essential. Also that the cloth used must be wet to be kept sweet. . . . Drying the cloth causes decomposition and keeping it in clean, cold water is like putting it in cold storage, preserving it in sweet condition. Pouring the water through more than once obtains a darker liquor but . . . a deteriorated flavor from the addition of tannin and other undesirable elements. The full flavor . . . is extracted by one pouring under efficient conditions."

See also a previous note by Willcox (E. S. R., 30, p. 558).

Monthly bulletin of the dairy and food division of the Pennsylvania Department of Agriculture (*Penn. Dept. Agr., Mo. Bul. Dairy and Food Div., 11 (1913), No. 4-5, pp. 131*).—This bulletin contains the text of the Pennsylvania laws of 1913 relating to food products, notes on food topics from miscellaneous current publications, tabulated analyses of food products made under the direction of the dairy and food commissioner up to June 1, 1913, and miscellaneous data incident to food inspection.

[Report of Congress of Royal Sanitary Institute, Exeter, 1913].—Section C—domestic hygiene (*Jour. Roy. Sanit. Inst., 34 (1913), No. 11, pp. 509-526*).—Among the titles of papers presented are the following: Labor-saving Contrivances, by Miss E. P. Hughes; How to Make the Lessons on the Care and Feeding of Infants of Practical Use to the Babies of To-day, by Miss A. C. Henderson; and The Training of Boys in Cooking after Leaving School, by C. H. Senn.

The popular cook book and family book—a new practical manual of Spanish, French, English, and Mexican cookery, hygiene, and domestic economy (*La Cocinera Poblana o el Libro de las Familias—Novísimo Manual Práctico de Cocina Española, Francesa, Inglesa y Mexicana, Higiene y Economía Doméstica. Mexico, 1913, 8 ed., rev. and enl., pp. 477*).—Besides numerous recipes for dishes common in other countries, this book contains a section devoted to Mexican cooking.

Food materials and condiments—their composition and influence upon health with special reference to the ash constituents, R. BERG (*Die Nahrungs- und Genussmittel—ihre Zusammensetzung und ihr Einfluss auf die Gesundheit, mit besonderer Berücksichtigung der Aschenbestandteile. Dresden, 1913, pp. 60*).—This volume contains the results of original analyses of over 300 common food substances, the proportions of the different mineral constituents present having been determined in each case. In his introduction, the author develops the theory previously noted (E. S. R., 30, p. 562) that to be adequate the diet must furnish sufficient inorganic bases to maintain the alkalinity of the body fluids, and for the practical application of this he believes that such detailed analyses as are here given are essential.

[Rations and equipment for men engaged in fire prevention and control on national forests], S. C. BARTRUM (In *Fire Prevention and Control on National Forests. [Ogden, Utah: U. S. Forest Serv., 1913], pp. 8-10, 18-20, pl. 1*).—Lists are given, among other data, as to the cooking equipment and subsistence supplies required per day for 1 to 30 men. There is also a brief discussion of the commissary, which includes some suggestions for the camp cook and information regarding the purchase of supplies and similar topics.

Modern reforms in nutrition, M. RUBNER (*Arch. Hyg.*, 81 (1913), No. 4-5, pp. 179-259).—The author reviews modern theories of diet, especially those of Chittenden and Hindhede, which point to a lowered protein standard, and gives the reasons for his own belief that in general the Voit standard is the safest for general use.

Diseases due to deficiencies in diet, F. G. HOPKINS (*Lancet [London]*, 1913, II, No. 19, pp. 1309, 1310).—In this address before the Section of Therapeutics and Pharmacology of the Royal Society of Medicine, October 21, 1913, the work of Funk, Holst, and others is discussed, along with the general subject of the relation of deficiencies in diet to such diseases as beri-beri, scurvy, infantile scurvy, and pellagra.

In conclusion reference is made to the author's work with rats infected by sarcoma artificially produced, one group being fed upon bread and milk and the other upon an artificial diet. "In the absence from diet of the substances which promote the growth of normal tissue the sarcoma grew at only one-fourth of its normal rate. Such a result has perhaps no more than an academic importance, but it shows that a neoplasm, like a normal tissue, requires for its growth certain at present unknown substances, which it acquires less readily from the tissues than from the food supply of its host."

Nitrogen metabolism during chronic underfeeding and subsequent realimentation, S. MORGULIS (*Biochem. Bul.*, 3 (1913), No. 9, pp. 74, 75).—This article is a preliminary note on some of the results obtained from experiments with a dog which was subjected to severe underfeeding for many weeks and then put on a rich diet.

The urines were tested with litmus daily. On the third day after the return to the full diet the urine became thoroughly alkaline but remained so for a few days only. The alkalinity appeared to be due to an excess of ammonium carbonate, and the author suggests that "the great influx of phosphates and acid cleavage products of the protein digestion, coupled with a generally impaired condition of the liver and of the whole organism, for that matter, resulted in a rapid elimination of ammonium carbonate before its transformation into urea."

The general physiological transformation of the animal will be discussed in detail in a later publication.

Contribution to the study of nitrogen metabolism—new methods for the determination of urea, ammonia, and amino acids, L. LEMATTE (*Bul. Sci. Pharmacol.*, 20 (1913), Nos. 10, pp. 577-584; 11, pp. 647-659).—In addition to a description of original methods for the determination of the above-mentioned metabolic products by means of phosphotungstic acid, magnesium chlorid, and hypobromid of sodium, the author states the generally received theories of nitrogen metabolism.

Fasting studies.—XII, The ammonia, phosphate, chlorid, and acid excretion of a fasting man, D. W. WILSON and P. B. HAWK (*Jour. Amer. Chem. Soc.*, 36 (1914), No. 1, pp. 137-146, fig. 1).—During a preliminary period of 4 days' duration the subject was given a diet supplying 21.86 gm. of nitrogen. This was followed by a fasting period of 7 days' duration, 1,500 cc. of water being taken per day. A low-proteid period of 4 days' duration followed the fasting period, the daily intake of nitrogen being about 5.23 gm. and the energy value of the diet, 1,800 calories. A final period of 5 days' duration on a high-proteid diet followed, the daily food being increased to the amount eaten during the preliminary period.

The acidity of the urine increased during the fasting period, decreased during the low-proteid period, and in the high-proteid period returned very nearly to the average value noted in the preliminary period. Phosphoric acid excretion decreased in the fasting period, increased somewhat in the low-proteid period,

and in the final period increased still further, approaching the values observed in the preliminary period. The chlorid excretion diminished during the fasting period and the low-proteid period, returning in the high-proteid period practically to the values observed in the preliminary period. These and other factors are discussed.

Fasting studies.—XIII, The output of fecal bacteria as influenced by fasting and by low and high protein intake, N. R. BLATHERWICK and P. B. HAWK (*Jour. Amer. Chem. Soc.*, 36 (1914), No. 1, pp. 147-152).—In connection with the experiment previously noted, the influence of the dietary conditions on fecal bacteria was studied.

According to the author's conclusions, a 7-day fast lowered the daily excretion of fecal bacterial nitrogen by a subject weighing 76 kg. from 1.571 gm. to 0.101 gm. "The percentage of the fecal nitrogen which was present as bacterial nitrogen was decreased from 55.82 per cent to 32.29 per cent as a result of the fast. The percentage of dry bacteria in dry feces was slightly increased.

"The output of bacterial nitrogen and the output of bacterial substance were approximately the same on a low-protein diet as during fasting. With the ingestion of a high-protein diet these values underwent an immediate and pronounced increase.

"The percentage of the fecal nitrogen which was composed of bacterial nitrogen was about the same in the periods of low and high-protein ingestion.

"There was no definite relationship between the excretion of fecal bacteria and that of urinary indican.

"The ingestion of 5.25 gm. of nitrogen after the fast was followed by an excretion of fecal bacteria which was only one-fourteenth as great as when 4 times that amount of nitrogen was ingested before the fast."

The actual weight of the excreted bacterial substance was reduced from 14.336 gm. to 0.920 gm.

Studies on water drinking.—XV, The output of fecal bacteria as influenced by the drinking of distilled water at meal time, N. R. BLATHERWICK and P. B. HAWK (*Biochem. Bul.*, 3 (1913), No. 9, pp. 28-40).—This contribution to a long series of studies on the physiological effects of water drinking (E. S. R., 29, p. 267) is summarized by the authors as follows:

"When 500 cc. of distilled water was added to the usual water ingestion at each meal (100 cc.), a decrease was noted in the amount of bacterial nitrogen excreted daily in the feces. This held true for two subjects. One subject responded more freely to the influence of the water than did the other. When the water ingestion (100 cc.) was increased by 850 cc. per meal, a more pronounced decrease in the daily excretion of bacterial nitrogen was observed. This was more emphasized in the one case than in the other, but was very obvious in both.

"Since the amount of bacterial nitrogen occurring in the feces may, in a way, be considered an index of the utilization of the protein in the food, we are led to conclude that there was a more efficient utilization of the proteins and hence better digestion and absorption when water was taken with meals. In both cases the beneficial results were not confined to the periods of increased water intake, but continued into the periods following.

"Two subjects fed upon a uniform diet for a period of slightly more than 1 month were found to have an average content of 57.54 per cent of bacterial nitrogen in the fecal nitrogen. The average amount of dry bacteria excreted per day was 6.189 gm. The proportion of dry bacteria in dry feces was found to be 29.94 per cent.

"A decreased output of urinary indican was observed to accompany the copious water ingestion. There was, however, no definite relationship between

the values for urinary indican and fecal bacteria nitrogen under all conditions. A definite relationship would probably be accidental."

Studies on water drinking.—XVI, The influence of distilled water drinking with meals upon fat and carbohydrate utilization, N. R. BLATHERWICK and P. B. HAWK (*Jour. Amer. Chem. Soc.*, 36 (1914), No. 1, pp. 152-157).—Two subjects, young men, were maintained upon a uniform diet, and the effect was noted of the copious ingestion of distilled water with meals upon the utilization of the ingested fat and carbohydrate. "The utilization of these nutrients was apparently uninfluenced by the drinking of large volumes of water at meal time."

Studies on water drinking.—XVII, The ammonia output as an index of the stimulation of gastric secretion following water ingestion, F. WELLS and P. B. HAWK (*Jour. Amer. Chem. Soc.*, 36 (1914), No. 1, pp. 158-165).—In experiments with 2 men it was found that the ingestion of water at meal time was accompanied by an increase in the renal excretion of ammonia, directly proportional to the extra volume of water ingested.

"Inasmuch as certain experiments have demonstrated that water stimulates the flow of an acid gastric juice and as certain other experiments have demonstrated that the formation of acid in the body or the introduction of acid from without produces an increase in the urinary ammonia excretion, we feel justified in assuming that the increase in the ammonia excretion observed in our experiments was due directly to the stimulation of gastric secretion by the ingested water.

"The uniform relationship between the water ingestion and the ammonia output might perhaps be considered as indicating that there was an attempt on the part of the gastric cells to maintain a uniform acid concentration."

Calculated on the basis of 100 cc. increasing water ingestion, the increased ammonia excretion was found to be a trifle higher during moderate than during copious water drinking, indicating that after a certain limit in water ingestion is reached the water was less efficient as a stimulating factor in ammonia excretion. That different organisms may respond differently to identical stimuli was indicated by the fact that the ammonia output of one subject was 100 per cent greater than that of the other under uniform conditions.

"That the increase in the ammonia excretion did not arise from intestinal putrefaction was indicated by the finding of lowered indican values during the period of high water ingestion."

Concerning the proteins of muscle juice, F. BOTTAZZI (*Rend. Soc. Chim. Ital.*, 2. ser., 5 (1913), No. 11, pp. 282-285).—Technical studies are here reported with two proteins obtained from the expressed juice of different types of muscular tissue. One, found in solution, is named by the author myoprotein. For the other, held in suspension in the form of minute granules, he retains the classic term myosin. From 35 to 45 per cent, or even more, of the total protein of muscles was found to consist of these two forms. The viscosity, surface tension, and imbibition of the granular preparations were tested.

The extractives of muscle—creatosin, a new base of meat extract, R. KRIMBERG and L. IZRAÏLSKY (*Hoppe-Seyler's Ztschr. Physiol. Chem.*, 88 (1913), No. 4, pp. 324-330).—The authors have isolated two previously unknown bases from meat extract. One of these, to which the name creatosin has been given, has, in combination with the gold from auric chlorid used in its separation, the formula $C_{11}H_{23}N_3O_4Au_2Cl_4$. Its detailed characteristics and those of the other, as yet unnamed base, are to be studied further.

Studies in the heat production associated with muscular work, J. S. MACDONALD (*Proc. Roy. Soc. [London]*, ser. B, 87 (1913), No. B 593, pp. 96-112, pl.

1, fig. 1).—This article deals with work done with a previously described calorimeter of the Atwater-Rosa-Benedict type (E. S. R., 27, p. 367). Besides a detailed description of the apparatus, including a bicycle ergometer, the methods and formulas used in calculating results are given at length.

A bicycle ergometer and respiration apparatus for the experimental study of muscular work, A. KROGH (*Skand. Arch. Physiol.*, 30 (1913), No. 4-6, pp. 375-394, figs. 5).—The author describes a bicycle ergometer of special construction for recording and determining muscular work. This was used in connection with a respiration apparatus of the closed-circuit type which will record quantitatively the pulmonary ventilation and the oxygen absorption.

"The CO₂ percentage of the 'alveolar expired air' is not identical with the average CO₂ tension in the alveoli but generally lower.

"The composition of the alveolar expired air can be calculated from the volume and composition of the total expired air when the dead space of the subject has been determined, but the average CO₂ tension in the alveoli can not at present be determined with certainty, especially during muscular work."

ANIMAL PRODUCTION.

Heredity and sex, T. H. MORGAN (*New York, 1913, pp. IX+282, figs. 121*).—The chapters in this book are as follows: The evolution of sex; the mechanism of sex determination; the Mendelian principles of heredity and their bearing on sex; secondary sexual characters and their relation to Darwin's theory of sexual selection; the effects of castration and of transplantation on the secondary sexual characters; gynandromorphism, hermaphroditism, parthenogenesis, and sex; fertility; and special cases of sex inheritance.

Breeding operations, J. FAEMER (*Ann. Rpt. Punjab Vet. Col. and Civ. Vet. Dept., 1912-13, pp. 9, 10*).—This relates to the production of cattle, sheep, horses, and donkeys in the Punjab. A statement is given showing the average cost of feed, keep, attendance, etc., of horse, pony, and donkey stallions.

Catalogue of the ungulate mammals in the British Museum (Natural History), R. LYDEKKER (*London, 1913, vol. 1, pp. XVII+249, figs. 55*).—This book deals with a part of the family Bovidae, including cattle, sheep, goats, serows, and related ruminants.

Winter steer feeding, 1912-13, J. H. SKINNER and F. G. KING (*Indiana Sta. Bul. 167 (1913), pp. 3-43*).—A continuation of work previously noted (E. S. R., 28, p. 670).

Three lots of 10 grade Shorthorn steers each, weighing approximately 830 lbs. each and grading as good to choice light feeders were fed during a 180-day period a basal ration of shelled corn and cotton-seed meal, lot 1 receiving clover hay, lot 2 corn silage, and lot 3 clover hay and corn silage as roughage. The addition of silage to a ration of shelled corn, cotton-seed meal, and clover hay decreased the grain consumption 2.38 lbs. and the hay consumption 7.84 lbs. daily per steer, reduced the cost of gain 1.18 cts. per pound, but did not greatly affect the rate of gain on the cattle. The substitution of corn silage for clover hay in the ration reduced the corn consumption 2.25 lbs. daily per head, and the cost of gain 1.26 cts. per pound, but reduced the rate of gain 0.11 lb. daily per steer. Corn silage detracted slightly from the finish of the cattle. Lot 1 returned a profit, including pork produced, of \$10.98 per head; lot 2 of \$18.50 per head; and lot 3 of \$15.41 per head.

Comparing two lots of similar steers receiving a basal ration of shelled corn, cotton-seed meal, and corn silage, it was found that the substitution of oat straw for clover hay did not produce any marked effect on the appetites, gains, or selling value of the cattle but reduced the cost of gain 42 cts. per 100 lbs.

Two lots of 10 2-year-old steers each were fed a ration of shelled corn, oat straw, and corn silage, lot 1 receiving in addition 4 lbs. cotton-seed meal per 1,000 lbs. live weight and lot 2, 2.5 lbs. The latter lot maintained keener appetites, made more rapid gains, produced gains for 0.82 ct. per pound less, and returned a profit, including pork, of \$19.05 per head as compared with \$15.06 per head in lot 1. Cattle acquired the same finish in both lots.

Two lots of steers received a ration of shelled corn, oat straw, and corn silage, lot 1 receiving in addition soy-bean meal and lot 2 cotton-seed meal. It was found that the substitution of the soy-bean meal reduced the quantity of feed eaten and gains made by the cattle, produced gains for 7.89 cts. per pound as compared with 7.74 cts. by the cattle fed cotton-seed meal, but lessened the valuation of the cattle 0.15 ct. per pound. The profit, including pork, from the cattle fed soy-bean meal was \$15.81 per head as compared with \$19.05 per head from cattle fed cotton-seed meal. Soy-bean meal acted as a laxative with full-fed cattle.

Comparing the economy of long and short feeding it was found that cattle fed cotton-seed meal, oat straw, and corn silage gained 2.01 lbs. daily per head for 70 days, while full-fed cattle during the same time gained 2.85 lbs. daily per head. Cattle from which corn was withheld the first 70 days averaged 2.20 lbs. daily per head for 180 days as compared with 2.41 lbs. daily by long-fed cattle. Short-fed cattle increased 0.9 ct. per pound in value in 6 months while long-fed cattle increased 1.2 cts. Short-fed cattle returned \$2.10 per head less profit, including pork, than long-fed cattle.

Feeding of calves on skimmed milk and cassava meal, DECHAMBRE (*Indus. Lait. [Paris], 38 (1913), No. 50, pp. 801-811*).—An account of the feeding of cassava meal as a supplement to a skimmed milk ration for calves, with favorable results.

Rations for fattening western yearling sheep, F. B. MUMFORD, E. A. TROWBRIDGE, and H. HACKEDORN (*Missouri Sta. Bul. 115 (1913), pp. 329-345*).—Seven lots of 20 sheep each, weighing approximately 78 lbs. each, were fed during a 14-week period as follows: Lot 1, shelled corn and timothy hay; lot 2, shelled corn and clover hay; lot 3, shelled corn and linseed oil meal 6:1 (by weight) and clover hay; lot 4, shelled corn and cotton-seed meal 6:1 (by weight) and clover hay; lot 5, shelled corn, corn silage, and clover hay; lot 6, shelled corn and clover hay (self feeder); lot 7, shelled corn and clover hay without shelter. The results of this experiment are summarized in the following table:

Feeding trial with yearling sheep on various rations.

Lot.	Average daily gains per head.	Feed per 100 pounds gain.			Cost of 1 pound gain.	Average shrink per head.	Average cost of feed per head.	Dressing percentage.	Grade of carcasses.
		Grain.	Silage.	Hay.					
1	Lbs. 0.213	Lbs. 549.28	Lbs.	Lbs. 660.28	Cts. 7.514	Lbs. 5.70	\$1.510	49.6	Fair.
2	.235	524.89	.....	730.73	7.402	5.75	1.730	52.2	Good.
3	.252	490.70	.....	703.43	7.632	6.00	1.890	50.5	Do.
4	.242	511.15	.....	747.57	7.888	4.50	1.873	50.2	Do.
5	.271	455.72	278.61	489.11	6.187	6.50	1.644	49.7	Do.
6	.245	637.42	.....	564.86	7.377	5.20	1.688	49.8	Prime.
7	.200	887.50	.....	617.09	9.424	4.60	1.733	50.6	Good.

It is concluded that under the conditions of the experiment a ration of shelled corn, clover hay, and corn silage was the most economical, and a ration of shelled corn and clover hay second.

It is stated that "as the price of corn and hay increases, it will be found economical to add a nitrogenous supplement. In these trials linseed oil cake was superior to cotton-seed meal. Clover hay proved to be greatly superior to timothy hay as a roughness for fattening western yearling sheep, with shelled corn as the grain ration.

"The lot fed in the open required 6.4 bushels more corn for each 100 lbs. gain than did the lot fed on the same ration in the barn. Feeding sheep in an open lot without shelter from the winter rains and snow is undoubtedly a poor practice."

Fattening western lambs, J. H. SKINNER and F. G. KING (*Indiana Sta. Bul.* 168 (1913), pp. 47-68).—The object of the work reported in this bulletin was to determine the comparative feeding value of the more common roughages of the farm and the advisability of using some concentrated commercial feeding stuff for fattening lambs. Nine lots of 25 choice western lambs weighing approximately 63 lbs. each were fed during a 90-day feeding period with shelled corn and various supplements, with results as shown in the following table:

Summary of lamb-feeding experiments with various supplements to shelled corn.

Lot.	Kind of supplement.	Average daily gain per head.	Feed per pound of gain.					Cost of gain per pound.	Profit per lamb.
			Shelled corn.	Oats.	Cotton-seed meal.	Corn silage.	Clover hay.		
		<i>Lbs.</i>	<i>Lbs.</i>	<i>Lbs.</i>	<i>Lbs.</i>	<i>Lbs.</i>	<i>Lbs.</i>	<i>Cents.</i>	
1	Cotton-seed meal, silage.	0.276	3.51	0.15	0.50	9.62	-----	4.87	\$1.77
2	Oats, clover, silage (open lot). .	.308	1.94	2.02	-----	5.43	3.34	6.24	1.58
3	Clover. ....	.357	3.42	.11	-----	-----	5.90	6.13	1.76
4	Cotton-seed meal, clover. ....	.368	2.91	.11	.42	-----	5.85	6.34	1.86
5	Clover(morning),silage(evening). .	.329	3.57	.12	-----	4.40	3.31	5.35	1.93
6	Clover (morning and evening), silage (morning and evening). .	.337	3.49	.12	-----	4.96	3.11	5.25	2.21
7	Cotton-seed meal (smaller ration), clover, silage. ....	.355	3.02	.11	.43	5.46	2.94	5.52	2.05
8	Cotton-seed meal (larger ration), clover, silage. ....	.360	2.74	.11	.65	5.39	2.90	5.66	1.97
9	Oats, clover, silage (barn). ....	.319	1.88	1.96	-----	5.81	3.18	6.10	1.41

The most profitable rations were those in which shelled corn, clover hay and corn silage were fed. When no silage was fed the rate of gain was satisfactory but the cost of gain was higher than when silage was added to the ration. When silage was fed as the only roughage, the gain was more economical but not as rapid as when clover hay also was fed. The finish of the lambs fed silage alone was also poorer than when both roughages were fed. Oats in the proportion used proved to be too expensive to be used as a partial substitute for corn. Cotton-seed meal increased the rate of gain but did not in all cases add to the finish of the lambs while it always added to the cost of gain. Lambs kept in a barn made as rapid and as economical gains as those in an open shed but did not finish or sell as well.

With the object of determining the influence of shearing during fattening on the appetite, rate of gain, and cost of gain of fattening lambs, two lots each of shorn and unshorn lambs were fed on shelled corn and clover hay, lots 1 and 3 receiving corn silage in addition. The shorn lambs had keener appetites, consumed more feed, and made more rapid gains than unshorn lambs. However, the cost of gain was practically the same. Unshorn lambs yielded heavier fleeces but the shearing had no effect on the profit. Shorn lambs did not require dipping, which was necessary with unshorn lambs.

[On the sheep-carrying capacity of the Roseworthy Agricultural College farm], A. J. PERKINS (*Jour. Dept. Agr. So. Aust.*, 17 (1913), No. 3, pp. 364-390, figs. 4).—This article reports work covering a period of 7 years. The total average acreage of grazing crops on this farm was 149.1 acres and of ordinary pasture 312.2 acres, making a total of 461.3 acres in pasture; and under cultivation 1,072.9 acres, making a total of 1,534.2 acres in total arable-grazing land. The yearly average number of sheep raised was 1,370 or 0.89 sheep per acre of arable-grazing land, and 2.97 sheep per grazing acre.

The feeding stuffs fed to 1,254 head of sheep during 1912-13 (a period largely of hand-feeding) were as follows: Bran 2,766 bu., crushed corn 5,550 lbs., polard 24 bu., hay chaff 11½ tons, straw chaff 19½ tons, baled straw 1,500 lbs., molasses 500 lbs., costing in all £279 5d., or about \$1.11 per head.

The sheep-carrying capacity for the ordinary pasture (fields temporarily out of cultivation) averaged 1.51 head per acre; for stubble fields during 4 months, December to March, 1.55; for fallow grazing, September to December, 0.66; and for the forage crops: Rape, June to January, 2.79; kale, September to January, 5.87; turnips, September to December, 7.27; vetch, September to December, 6.74; peas, September to March, 4.03; lucern, 12 months, 1.35; and sown grasses, consisting of rye grass, cocksfoot, Kentucky blue grass, prairie grass, and sulla, 1.55 head per acre.

The growing and fattening of hogs in the dry lot and on forage crops, E. S. GOOP (*Kentucky Sta. Bul.* 175 (1913), pp. 311-356, figs. 10).—The results of experiments reported in part 1, which treats of the growing and fattening of hogs in the dry lot, demonstrated that with one lot of 39-lb. pigs a gain of but 25 lbs. per head in 196 days was secured on corn alone in a dry lot and at a cost of 17.8 cts. per pound, whereas the same pigs were made to gain 212 lbs. per head in the next 155 days by supplementing the corn meal with shipstuff, green alfalfa, and alfalfa hay at a cost of 5.3 cts. per pound. Forty-pound pigs gained 263 lbs. per head in 223 days at a cost of 5.9 cts. per pound gain by the feeding of middlings, with a small amount of tankage and oil meal for the first 75 days, when the oil meal and tankage were discontinued and corn meal introduced and fed in increasing amounts until at 195 days the pigs were receiving corn meal and middlings 1:1, with corn meal alone for the final 4 weeks. Shipstuff and middlings compared favorably when fed with corn meal to pigs.

Four lots of pigs weighing approximately 64 lbs., fed during a 125-day feeding period as follows: Lot 1 corn meal, lot 2 corn meal, green alfalfa, and alfalfa hay, lot 3 corn meal and soy-bean meal 7:1, and lot 4 corn meal and tankage 7:1, made 86, 142, 139, and 159 lbs. gain per head, costing 6.39, 5.3, 4.79, and 4.8 cts. per pound of gain.

Three lots of 10 hogs each, weighing about 143 lbs. each, and fed 56 days as follows: Lot 1 corn meal alone, lot 2 corn meal and soy-bean meal 10:1, lot 3 corn meal and tankage 14:1, made 76, 84, and 93 lbs. gain per head, costing 5.82, 5.42, and 5.07 cts. per pound of gain, respectively. Comparing the 39-, 64-, and 143-lb. pigs fed corn meal alone it is noted that this becomes a more balanced and economical feed for a hog as he matures, but that in all cases the addition of a nitrogenous supplement such as green alfalfa, alfalfa hay, and soy beans increases the economy of gains.

The average gain made per bushel by all lots of hogs receiving corn meal alone in these dry lot experiments was 8.3 lbs. and by lots receiving a nitrogenous supplement 12.92 lbs.

Runts fed a balanced ration made economical, but small gains. The greatest drawback in the feeding of runts proved to be their slow growing qualities.

Ground wheat, used as a sole ration for pigs averaging 61 lbs. and fed 125 days produced 40 per cent larger gains than corn meal alone fed to a similar lot.

The results of experiments reported in part 2, which deals with the growing and fattening of hogs on forage crops, demonstrated that young, growing cereals such as rye, oats, barley, and wheat contain much more protein and ash and less fiber than the same cereals when more mature and should be classified as nitrogenous instead of carbonaceous roughages. These pastures should be grazed by hogs when the plants measure between 6 and 15 in. in height. As high as 18 lbs. gain per bushel of grain fed has been secured with pigs running in pasture, whereas pigs running on forage crops without grain scarcely maintained their weight. A one-half to three-fourths feed of grain fed during spring, summer, and early fall required the pigs to get the full benefit of the forage crops.

Two lots of 47-lb. pigs fed 155 days as follows: Lot 1 corn meal and rye pasture, lot 2 corn meal and soy beans 6:1 and rye pasture, averaged 168 and 201 lbs. per head, respectively, at the end of the test. Of 2 other lots, one fed corn meal and rye pasture for 147 days averaged 174 lbs., another fed corn meal and tankage 10:1 and rye pasture averaged 214 lbs. In each case greater profits per bushel of corn fed were realized on those lots receiving nitrogenous supplement.

Two lots of 66-lb. pigs fed during 124 days as follows: Lot 1 corn meal, clover, and rye pasture, lot 2 corn meal in a dry lot, averaged 215 and 150 lbs. per head, respectively, at the end of the test. Economy of gains favored the first lot.

Pigs weighing 51 lbs. fed during 166 days on a ration of corn meal and soy-bean meal 9:1 and successive rye, oat, and succotash pastures averaged 222 lbs. at the end of the test and gained 16.47 lbs. for every bushel of grain consumed. It is estimated that each acre pastured was worth \$33.68.

The average gain made per bushel of grain by hogs running on pastures was 15.02 lbs. Estimating pork at 8 cts. per pound the grain fed these hogs realized \$1.20 per bushel, while the average cost was 68.4 cts. per bushel.

Pasture and grain crops for hogs in the Pacific Northwest, B. HUNTER (*U. S. Dept. Agr. Bul. 68 (1914), pp. 27, figs. 9*).—This bulletin deals with crops and systems of cropping with reference to economical pork production in the Pacific Northwest.

The advantages of hogging off crops are considered. The crops generally used for this purpose are wheat, field peas, corn, and barley. The various pasture crops and management methods are discussed, and suggestions offered. It is stated that the utilization of these methods offers an opportunity for profitable pork production in the Pacific Northwest on a much larger scale than at present practiced.

Comparison of pasturing and dry lot feeding methods in swine fattening, M. PORR (*Mitt. Deut. Landw. Gesell., 28 (1913), No. 44, pp. 605-608*).—Two lots of 6 pigs each, weighing approximately 26 kg. per head, were fed during a period of 20 weeks on barley meal, steamed potatoes, fish meal, and skim milk, lot 1 being on pasture and lot 2 in dry lot.

Lot 1 made an average gain per head of 101.7 kg., costing 0.564 mark per kilogram of live weight (6.1 cts. per pound); and lot 2, 104.2 kg., costing 0.551 mark per kilogram. However, during the first 14 weeks the gains and cost of gain were approximately the same, the advantage going to the pigs in the dry lot only after they had reached 100 kg. weight. The bacon measurements of the pastured pigs were 6.8 cm. (2.65 in.) in the forequarter and 5.85 cm. at the loin; of the dry lot-fed, 7.2 and 6.2 cm. The average weight of the stomach of pigs of lot 1 was 617 gm., length 23.8 cm., breadth 12 cm., and volume content 988 cc.; of lot 2, 692 gm., 24.3 cm., 12.7 cm., and 912 cc., respectively. The average weight of the cecum of pigs of lot 1 was 216.7 gm., length 27.7 cm., breadth 13.2

cm., and volume content 2,337 cc.; of lot 2, 201.7 gm., 28.3 cm., 12 cm., and 1,842 cc., respectively.

[Jacks and mules], J. J. HOOPER and W. S. ANDERSON (*Kentucky Sta. Bul. 176 (1913), pp. 359-409, figs. 27*).—Part 1 of this bulletin deals with the principal blood lines of jack stock in Kentucky, the feed, care, and management of jacks and jennets, and methods of judging. Parts 2 and 3 treat of the rearing of mules, the best type of mare for producing mules, the feeding of mules, and market requirements and type.

Part 4 reports feeding experiments in which dried brewers' grains, although not relished by mules, were consumed by them, as well as by horses, in grain mixtures of cracked corn, rolled oats, and bran containing as high as 20 per cent by weight of this feed. During the experiment the animals worked as hard and as satisfactorily as they did before the brewery grains were fed them in such large proportions. The dried brewers' grains proved to be slightly constipating.

In an experiment comparing the relative value of corn and a mixed feed consisting of cracked corn, wheat bran, and oil meal 3:1:1, no noticeable difference was observed in the health, spirit, or weight of the mules. Cotton-seed meal was found to be not so palatable as oil meal. The skin and hair of mules fed the grain mixture were more soft and glossy than those on ear corn, probably due to the oil meal.

It is stated that a great difference was noted in regard to the behavior and efficiency of the 16 mules in the experiment. "The ones that were deep and wide of barrel, large in bone, and closely coupled, showed the least loss of weight on warm days when the work was unusually hard and prolonged. Such mules were ready for their feed and were never ill-tempered. Some of the other mules were long and shallow in body and light in bone, and the last rib did not fit close to the hip. Such mules were fretful; were off feed occasionally, and lost in weight when unusual work was put upon them."

Corn versus oats for work mules, E. A. TROWBRIDGE (*Missouri Sta. Bul. 114 (1913), pp. 307-325, pl. 1*).—This bulletin reports experiments with 2 lots of 2 mules, each fed by the reversal method during a period of 2 years, to determine the relative feeding values of corn and oats.

The lots were maintained in equally good health. The corn-fed mules kept their weight slightly better than did the oat-fed mules. No difference was shown in ability to endure hard work or in spirit. The oat-fed mules required 3 per cent more grain and 1.4 per cent more hay to maintain approximately live weight than did the corn-fed mules. Six per cent more work was performed by the corn-fed than the oat-fed mules. The mules fed corn and mixed timothy and clover hay were maintained 28 per cent more economically than those fed oats and mixed hay, when corn was valued at 50 cts. per bushel, oats at 40 cts. per bushel, and hay at \$10 per ton.

The odd chromosome in the spermatogenesis of the domestic chicken, ALICE M. BOBING and R. PEARL (*Jour. Expt. Zool., 16 (1914), No. 1, pp. 53-83, figs. 91*).—The investigations of Guyer with Black Langshans, in which he reported the presence of an X-chromosome, are cited, and it is pointed out that if this X-chromosome is assumed to be a sex chromosome the male bird must be heterozygous in regard to sex.

The authors conducted an investigation in which material from the testes of 12 pure Barred Plymouth Rock and cross-bred males was used. From this they conclude that "there is no good observational or statistical evidence of the existence of a sex chromosome in males of domestic chickens of the Barred Plymouth Rock breed. In 11.82 per cent of first spermatocytes and 3.06 per cent of second spermatocytes, there is a piece of chromatin similar to that called an X-chromosome by Guyer in Langshan males. This is not to be regarded as

an X-chromosome in Barred Plymouth Rock males, because: (1) It is present in spermatocytes of both orders; (2) a statistical study of Barred Plymouth Rock cells in comparison with those of the hemipteran *Philæus spumarius* shows that it is present in too few I spermatocytes and in too many II spermatocytes, or vice versa; (3) it is still present in too few cells, if it should be interpreted as one of those rare cases where the odd chromosome divides in either the I or II spermatocyte division; (4) it varies in shape; (5) it varies in size; (6) it varies in number; (7) in no single cells is it of such a shape or size, or in such a position, that it could not readily be interpreted as anything else than an X-chromosome."

The crest of the chicken and duck.—Its cause, formation, and inheritance, F. KRAUTWALD (*Die Haube der Hühner und Enten. Ihre Ursache, Entstehung und Vererbung. Inaug. Diss., Univ. Bern, 1910 pp. 163, figs. 17*).—Studies were made of the peculiarities of feather crested types of domestic poultry. It was found that this condition only occurred in the domesticated breeds, and is an outgrowth of the cuticle which envelops the head. This portion thickens and becomes coarsely vascularized.

The crest is feathered, but the feathers which are of normal make-up are larger and in greater numbers, thus accounting for the characteristic feathered tuft on the crested fowl. With chickens the crest occurs in the frontal region, whereas in ducks it is to be found in the parieto-occipital region. With chickens it takes the form of a congenital internal hydrocephalus, while with ducks it is a congenital occipital encephalocele. In the former case the crest is not completely ossified and is half globular in form, forming a frontal protuberance. In the latter case the skin covers a hole in the lambdoid region. The crest is an external manifestation of a pathological disease which develops in the embryo, and its situation, size, and nature depend upon the situation and degree of the disease. The crest is present in the downy chick and is inherited, the same as other accompanying skull peculiarities. It has become a permanent race characteristic of some breeds of chickens, but is not a permanent feature with the duck.

Egg-laying competitions at Hawkesbury Agricultural College and Experiment Farm, Richmond, New South Wales, D. S. THOMPSON (*Dept. Agr. N. S. Wales, Farmers' Bul. 70 (1913), pp. 19, figs. 11*).—This material has been referred to from another source (E. S. R., 29, p. 472). In addition is noted "the establishment of a new world's record for first-year laying" by a pen of six Indian Runner ducks, laying 1,601 eggs averaging 31 oz. per dozen.

Care and marketing of eggs, compiled by H. E. UPTON (*Dept. Agr. Brit. Columbia Bul. 55 (1913), pp. 15, figs. 5*).—Directions are given for the care, storage, preservation, and grading of eggs, with suggestions on methods of marketing.

DAIRY FARMING—DAIRYING.

Nutrients required for milk production, C. H. ECKLES (*Missouri Sta. Research Bul. 7 (1913), pp. 91-140*).—This bulletin is a continuation of studies previously reported (E. S. R., 26, p. 475).

"The object of the investigation was to secure data regarding the requirements for milk production by cows yielding milk of varying richness. Data are presented giving the feed consumed, with chemical analyses, and of milk produced with analyses for 8 cows for an entire year. The milk of these cows ranged from 3.4 to 6.09 per cent fat. Data of 2 other cows are included for shorter periods. These cows were all fed a ration of practically the same composition. The quantity fed was regulated so as to maintain a uniform

weight. All cows were kept farrow. A maintenance trial was made for 7 cows using the same ration as fed when in milk. A 10-day digestion trial was made for 5 of these when at maximum milk production and again when on maintenance.

"The data bear out the results of others that more energy value is required in the ration for rich milk than for milk lower in fat. The maintenance requirements for the 7 cows showed some variation but was close to Armsby's standard for cows of the same weight.

"The protein fed was in excess of that called for in the standard of Armsby or Haecker but no attempt was made to determine the minimum requirement. When the energy value of the ration, in excess of maintenance, was calculated by the use of 'production value' tables it was found that the cow producing milk with 3.4 per cent fat used 0.245 therms per pound while one with milk averaging 6.09 per cent fat used 0.524 therms per pound.

"When Haecker's maintenance requirement was used and the amount of 'digestible nutrients' calculated by using Henry's tables it was found that 6 cows used more than Haecker's standard and 4 less. When actual maintenance was deducted every cow used nutrients in excess of this standard. The deficiency increased with the richness of the milk. Four Jersey cows required from 23.1 per cent to 55.2 per cent more nutrients than called for by Haecker's standard. This standard is clearly too low for cows with rich milk. According to average digestion coefficients the 5 cows should have digested 70.8 per cent of the ration received during the digestion trial when in milk. The results showed only slight variation with individuals and an average of 65.57 per cent digested. On maintenance the same cows should have digested 66.69 per cent of the ration received, according to average figures, but the results were higher in every case and showed an average of 71.2 per cent.

"A calculation based upon the chemical analyses of the feed and the actual digestion coefficients showed the actual energy value used in the feed per pound of milk was lower than indicated by applying Armsby's 'production value' tables directly to the ration received. The cow producing milk with 3.4 per cent fat actually used only 0.235 therms per pound milk while for 6.09 per cent fat the requirement was 0.442 therms. The total energy required in the feed was slightly less per pound fat produced in the richer milk. However, after subtracting maintenance the energy per pound fat is consistently higher for the richer milk.

"The cheaper production of fat in the richer milk is shown to be due to a smaller maintenance requirement per unit of fat on account of the smaller size of the animals producing the richer milk. The energy value of the milk solids is greater in proportion to the energy value of the feed required with the milk lower in fat. This indicates the production of rich milk requires an increase in feed in excess of the increase in energy value of the milk. The cow is able to utilize energy in her ration to better advantage than is indicated by Armsby's 'production value' tables, which are based upon experiments with mature fattening animals. A tentative standard is given of energy value and protein for cows producing milk from 3 to 6.5 per cent fat."

Feeding sugar-beet pulp to dairy cattle, L. MALPEAUX (*Vie Agr. et Rurale*, 3 (1913), No. 1, pp. 13-16).—In trials comparing the value of ensiled beet pulp and beet fodder for dairy cattle it was observed that the pulp showed superior qualities for milk production, evidently due to its sugar content which develops during the ensilage process. Ensiled pulp of good quality evinced no harmful influence on the quality of the milk, aside from a tendency to increased acidity and a special flavor.

Effect of alkali water on dairy cows, C. LARSEN and D. E. BAILEY (*South Dakota Sta. Bul. 147 (1913), pp. 300-325*).—This bulletin is a continuation of Bulletin 132 (E. S. R., 27, p. 282) and reports experiments with 3 barren cows which were fed a definite ration of grain and silage, and watered during a preliminary 10-day period with normal well water. In the experimental period of 10 days cows 1 and 2 received a strong alkali water and cow 3 soft water.

During the 10-day preliminary period the cows consumed on the average 27.824 lbs. of minerals. Of this 1.9 per cent was in the water, 69.6 per cent in the hay, 10.1 per cent in the grain, 16.2 per cent in the silage, and 2.2 per cent in the salt. Of all the minerals consumed during this period 95.7 per cent was recovered, 5.3 per cent being through the milk, 12.8 per cent through the urine, and 75.6 per cent in the feces.

During the experimental period the cows receiving alkali water consumed an average of 30.7 lbs. minerals, of which 81.1 per cent was recovered, 5.1 per cent being in the milk, 20 per cent in the urine, and 56 per cent in the feces. The cow receiving soft water consumed 24,132 lbs. mineral, of which 82.8 per cent was recovered, 3.9 per cent being in the milk, 13.7 in the urine, and 55.2 per cent in the feces. It is noted that "the increase in ash constituents from the alkali water consisted chiefly of sodium, sulphur, chlorin, and calcium. The alkali water contained about 600 times more sodium, about 30 times more sulphur, about 25 times more chlorin, and about 4 times more calcium than did the normal well water. Potassium, though present only in small quantities, was increased about 15 times over that of the normal well water."

The percentage intake and outgo of each of the ash constituents on the basis of the total consumed minerals for all cows in all periods is as follows: Sulphur, intake 3.8 per cent, outgo 3.4 per cent; chlorin, 3.5 and 2.7; phosphorus 2.7 and 2.6; calcium 4.6 and 4.6; magnesium 3.3 and 3.2; sodium 3.1 and 2.4; potassium 8.6 and 8.8; and silica 49.4 and 44.3 per cent, respectively. Sodium and chlorin constitute the largest part of the ash of perspiration and therefore the determined outgo contained less of these two.

On post-mortem, chemical examinations were made of the kidneys and liver. The composition of the organs of all cows was practically the same, and showed nothing abnormal.

It is concluded from this study that the drinking of alkali water by the cows did not produce what is known as the "alkali disease" or any indication of it. The principal mineral in the alkali water, sodium sulphate, was mostly eliminated through the kidneys. "The urine was increased from 114.6 to 151.4 lbs. during the 10-day periods by reason of drinking alkali water. This increase of urine output took place in spite of a decrease of 148 lbs. in the amount of water drunk during the same period.

"The percentage of ash constituents in the urine is increased by feeding alkali water to the cows. This together with the other above-mentioned facts indicates that the kidneys of cows drinking alkali water have an increased amount of work to perform."

The Fribourger black and white cattle and their introduction in the breeding of the Netherland Black Spotted breed, P. MÜLLER (*Jahrb. Wiss. u. Prakt. Tierzucht*, 8 (1913), pp. 1-87, figs. 20).—After describing the climatic conditions of the canton of Fribourg, Switzerland, and commenting on the adaptability of this section to cattle breeding, the author gives the breed characteristics of the Black and White breed of cattle and lists the principal blood lines, showing wherein the crossing of these cattle on the Netherland breeds has resulted in greater milk yield, increased fat content of milk, and improved milking and fleshing qualities.

What the searchlight of the Swedish Cow Testing Association revealed, J. J. DUNNE (*Hoard's Dairyman*, 46 (1913), No. 17, pp. 489, 495).—Results from the Malmöhus cow testing associations of Sweden are cited which indicate that the relative consumption of fat-free dry matter gradually diminishes as the percentage of fat in the milk increases. For each 0.1 per cent increase of milk fat 1.7 lbs. less feed is consumed in producing 2.2 lbs. of butter fat. It was found that 100 feed units gave an average increase of 10 cts. for each 0.1 per cent of increase in the milk fat percentage, and that there is a corresponding average decrease in the cost of producing 1 lb. of butter of 0.67 ct.

The use of electricity in the continuous sterilization of milk (*Agr. Gaz. N. S. Wales*, 24 (1913), No. 12, pp. 1079, 1080).—It is reported that satisfactory results of a preliminary nature have been attained in the sterilization of milk by use of electricity. Only a short time of exposure was found to be necessary and a high tension current is used. The advantages claimed for the process are that the milk is not heated unduly, that no coagulation occurs, that a continuous stream can be sterilized, and that therefore the method will be available for sterilizing milk on a large scale. In these experiments there was a complete destruction of all colon and allied bacilli and an enormous reduction in bacteria of all kinds. The milk was proved to be unaltered in composition and the enzymes were not destroyed. The taste of the milk was also unaltered and its nutritive value was not diminished.

The experiments also indicate that both natural and artificial contamination with tubercle bacilli can be rendered harmless.

Lobeck's biorisator process, W. FREUND (*Molk. Ztg. [Hildesheim]*, 27 (1913), No. 77, pp. 1489-1491; *abs. in Internat. Inst. Agr. [Rome]*, *Mo. Bul. Agr. Intel. and Plant Diseases*, 4 (1913), No. 12, pp. 1919, 1920).—The author reports upon a trial of the milk sterilization process recommended by Lobeck.

It was found that "when the biorisator worked normally it did not cause any alteration in the milk as to appearance, color, smell, taste, or capacity of separating cream. The peroxidases also remain unchanged, though catalase and reductase suffer a slight reduction. Coagulation is somewhat delayed, but nowise impaired. The vegetative forms of bacteria, with the exception of individual specially resistant spores of earth and hay bacteria, are killed. All pathogenic germs are certainly destroyed by the biorisator. Biorised milk contains no albumin coagulum and possesses the same fat globules as raw milk. It is considerably superior to raw and pasteurized milk in its keeping qualities."

Quality of the Massachusetts milk supply as shown by the inspection of the state board of health, H. C. LYTGOE (*Jour. Indus. and Engin. Chem.*, 5 (1913), No. 11, pp. 922-927).—This investigation was undertaken with special reference to certain enzyme and other reactions which might differentiate raw milk from pasteurized milk and new milk from old milk. After a review of the literature bearing on the subject of enzymes in relation to milk detection the author outlines the investigation as conducted by the Massachusetts state board of health, in which the reductase, peroxidase, and alcohol precipitation reactions were employed. The results of the investigation are summarized as follows:

"It is possible to detect commercial pasteurized milk by the Schardinger reaction but not by the peroxidase reaction. The amount of pasteurized milk on the market is greatest in the large districts. The average quality of the milk is considerably above the legal standard. The average quality of the pasteurized milk is very slightly below that of the raw milk but this does not appear to be due to adulteration. Pasteurized milk shows less fluctuation in composition than raw milk, and the percentage of samples below standard is less of the former.

"Fresh milk will not coagulate with an equal volume of 68 per cent alcohol. Ninety-four per cent of the samples delivered at the laboratory gave reactions for fresh milk; the balance was too old for use as fresh milk."

On the composition of goat's milk, A. STETTER (*Landw. Jahrb.*, 45 (1913), No. 2, pp. 161-178).—This gives numerous analyses of the milk of different breeds of goats and as reported by various investigators.

The progress of dairying in Japan, A. MIYAWAKI (*Hoard's Dairymen*, 46 (1914), No. 25, pp. 749, 759, figs. 2).—The author states that during the past 4 years there has been an increase in the consumption in Japan of condensed milk of 2.66, butter 63.07, and cheese 33.04 per cent. The supply of condensed milk has been largely imported while the butter is principally of home manufacture. The domestic production of butter has trebled in the past 4 years. During 1912 the following importations were made: Condensed milk \$1,044,939.50, butter \$34,915.50, and cheese \$40,331.50. The importations of dairy products are decreasing while the consumption is on the increase.

Amounts are given of several of the noted herds of Ayrshires and Holsteins in Japan.

The butter, cheese, and condensed milk industry (*Thirteenth Census U. S.*, 10 (1910), pp. 357-377).—Of the 8,479 establishments engaged in the industry in 1909, 56.4 per cent reported butter as their product of chief value, 42 per cent cheese, and 1.6 per cent condensed milk. Of the total value of products shown for the combined industry, butter factories contributed 71 per cent, cheese factories 16.1 per cent, and condensed milk factories 12.9 per cent.

The factories of the industry gave employment to 31,506 persons. The value of products reported for the butter, cheese, and condensed milk industry as a whole was nearly 11 times as great in 1909 as in 1879. Comparing 1909 and 1904 statistics it is found that in value of products an increase is shown for each class of establishment, the percentage being 64.5 for the butter factories, 51.9 for the cheese factories, and 72 for the condensed milk factories.

The total production of butter in 1909 was 1,619,415,263 lbs. and of cheese 320,532,181 lbs.

In 1909 Wisconsin was the most important State in the combined industry as measured by the value of products, having displaced New York, which had previously ranked first. Iowa ranked third as regards value of products, Minnesota fourth, and Illinois fifth. The States showing the highest percentage of increase, 1899-1909, were North Dakota 743.4 per cent, Oregon 670, Idaho 662.1, and Missouri 585 per cent.

Individual ownership controls 39.7 per cent, firm 12, corporations 15.5, and cooperative associations 32.7 per cent of the total number of establishments. Individual ownership represents 22.4 per cent, firm 9.8, corporation 41.3, and cooperative associations 26.5 per cent of the total valuation of products. The greater part of the value of the products of the industry was reported by establishments having products valued at \$20,000 or over, these establishments contributing 81 per cent of the total in 1909 as compared with 65.3 per cent in 1904.

Of the 8,479 establishments in the industry in 1909, 12.1 per cent employed no wage earners, 82.5 per cent employed from 1 to 5, and 4 per cent from 6 to 20. The expenses reported for 1909 were distributed as follows: For cost of materials 91.1 per cent, for wages 4.3 per cent; for salaries 1.4; and miscellaneous expenses 3.3 per cent, consisting of amounts paid for advertising, traveling expenses, repairs, taxes, insurance, etc. In 1909 34.3 per cent of the total production of butter reported for the industry was put up in prints and rolls as compared with 21.7 in 1899.

Of the total quantity of cheese made in the factories of the industry 92.3 per cent was full-cream cheese, 3.5 was part-cream cheese, 2.5 skimmed-milk

cheese, and 1.7 per cent various fancy varieties. There has been a marked decrease in the number of cream separators used by the factories, due to their increased use on the farms.

The scientific basis of cheese making and the use of artificial rennet in the manufacture of Emmental cheese, O. ALLEMANN (*Landw. Jahrb. Schweiz*, 27 (1913), No. 5, pp. 325-361; *abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases*, 4 (1913), No. 12, pp. 1920, 1921).—The author reports as to the advisability of using artificial rennet in the making of Emmental cheese.

It was found that the natural rennet made by the cheese makers and the rennet powder called artificial rennet do not differ much in their action. Aside from the natural rennet being somewhat richer in lactic acid bacteria it is no-wise superior to the artificial product.

Investigation and report on the manufacture of desiccated milk by the Andrews patent process, F. BUCH (*New York*, 1913, pp. 14, figs. 7).—This includes a description of a method of manufacturing milk powder and the necessary equipment for a milk-powder plant, an itemized account of probable expenses and profits from such a plant, and a list of some milk-powder products.

VETERINARY MEDICINE.

Annual report of the Bengal Veterinary College and of the Civil Veterinary Department, Bengal, for the year 1912-13, A. SMITH and P. J. KERR (*Ann. Rpt. Bengal Vet. Col. and Civ. Vet. Dept.*, 1912-13, pp. 4+10+VII+2+3).—This, the usual annual report, includes the reports of the epizootic diseases department in Calcutta and its vicinity and the Raymond Research Laboratory.

Regulations adopted by the live stock sanitary board and the live stock sanitary law of Alabama (*Opelika, Ala.*, 1912, pp. 30, figs. 3).—The regulations relating to Alabama are here brought together in convenient form. Illustrated plans for dipping vats with directions for their construction and a brief discussion of the arsenical and oil emulsion dips are appended.

Provisions of the agricultural law relating to diseases of domestic animals, 1913 (*N. Y. Dept. Agr. Circ.* 89 (1913), pp. 1917-1932).—The text of the law is presented.

Some immunity reactions of edestin.—III, The biological reactions of the vegetable proteins, B. WHITE and O. T. AVERY (*Jour. Infect. Diseases*, 13 (1913), No. 1, pp. 103-123).—A continuation of work previously noted (*E. S. R.*, 30, p. 680).

"Crystallized preparations of edestin from hemp seed and gliadin from wheat flour were used, and were specially prepared for anaphylactic experiments by Dr. Thomas B. Osborne. They were dissolved in water with the addition of the smallest possible amount of sodium hydrate necessary to effect solution.

"Edestin, even in small amounts, agglutinates washed red blood corpuscles of the sheep and of man. Both edestin-immune serum and peptone completely inhibit this action under the conditions noted. Gliadin, in the amounts used, exerts no agglutinating action. The serum of a rabbit which has been immunized with edestin contains a precipitating antibody for edestin, but none for gliadin in at least twice the concentration, giving a positive reaction with edestin. Edestin, in the presence of edestin immune serum, when both are used in nonanticomplementary and nonhemolytic amounts, completely binds complement. Gliadin, in the presence of edestin immune serum, fails to bind complement.

"[As to the] sensitizing dose, 0.0000001 gm. edestin, injected intraperitoneally, may be considered as the minimum sensitizing dose. Guinea pigs sensitized

with this amount react fatally when a sufficient amount of edestin (0.05 gm.) is injected intravenously after the proper interval. When the sensitizing dose is $\frac{1}{16}$ to 5 mg. the intravenous injection of $\frac{1}{4}$ mg. produces typical anaphylactic death in from 2 to 6 minutes. Pigs sensitized to edestin fail to react to intravenous injections of gliadin, or the globulins from squash seed, the castor bean, or the hazelnut. Two animals reacted positively, one fatally, when given an intravenous injection of flaxseed globulin. The fatal dose of flaxseed globulin was, however, 40 to 120 times the minimum fatal intoxicating dose of edestin. Guinea pigs born of a mother sensitized with edestin while pregnant inherit this sensitiveness but possess it to a somewhat less degree than does the mother.

"The intraperitoneal injection of edestin-immune rabbit serum passively sensitizes the guinea pig; 0.05 to 0.1 cc. of two such sera tested rendered guinea pigs sufficiently sensitive to react fatally to an intravenous injection of edestin on the following day. The degree of sensitiveness passively conferred appears to be somewhat greater than that induced by active sensitization. When edestin is hydrolyzed by an alcoholic solution of sodium hydrate according to the method of Vaughan, a substance is formed which produces a fatal intoxication in the guinea pig, apparently identical with true anaphylactic shock. The intravenous injection of one part of this poison to 40,000 parts of guinea pig by weight constitutes the minimum fatal dose.

"When suitable amounts of edestin and edestin-immune serum are allowed to remain in contact for a given length of time, a precipitate is formed which, when washed with salt solution and mixed with fresh guinea pig complement and incubated at body temperature, yields a substance or substances which, when injected into a guinea pig intravenously, produces a fatal intoxication, apparently identical in every way with the anaphylactic reaction. Fresh complement, when allowed to act under similar conditions with edestin alone, yields no poisonous substance. From edestin, therefore, by the action of immune serum and complement, under the experimental conditions noted, a toxic product is obtained which seems to correspond to the anaphylatoxin of Friedberger."

The action of alcohol in different concentrations upon the antigenic properties of horse meat protein, H. KODAMA (*Ztschr. Hyg. u. Infektionskrankh.*, 74 (1913), No. 1, pp. 30-44; *abs. in Chem. Abs.*, 7 (1913), No. 13, p. 2244).—Alcohol, when added to horse-meat extracts or solid tissues, destroys the antigenic properties of the protein in a few days. The greatest destruction is noted when the concentration of alcohol in the mixture is from 60 to 70 per cent. The anaphylactic reaction is the first to disappear, then the complement fixation, and finally the precipitin reaction.

The use of formalinized blood corpuscles in the complement fixation test, W. PFEILER and KÄTE LOSSOW (*Mitt. Kaiser Wilhelms Inst. Landw. Bromberg*, 5 (1913), No. 4, pp. 276-280).—The tests show that for practical purposes it is best to treat the red blood corpuscles in an unwashed state with formaldehyde, and then to keep them on ice or at room temperature. When required for use they should be washed.

Bacterial vaccine therapy: Its indications and limitations, L. HEKTOEN ET AL. (*Jour. Amer. Med. Assoc.*, 60 (1913), Nos. 17, pp. 1298, 1299; 18, pp. 1360, 1361; 19, pp. 1459-1461; 20, pp. 1539-1541; 21, pp. 1621, 1622; 22, pp. 1704, 1705; 23, pp. 1791, 1792; 24, pp. 1880, 1881; 25, pp. 1955, 1956; 26, pp. 2046, 2047).—This deals with the evolution of bacterial therapy, its pitfalls, theoretical considerations (varieties of immunity, antibodies, antigens, factors of active immunity, opsonic index, etc.); classification of bacterial vaccines (autogenous, stock, mixed stock and its use, and objections to autogenous vaccines); inocula-

tion technique and dosage; commercial stock vaccines, untoward effects of vaccines, and misleading therapeutic claims regarding them; dangerous recommendations, technical objections to marketed stock vaccines (possibility of dangerous contaminations, etc.); mixed vaccines a makeshift (incompatibilities, etc.); ideal vaccine therapy (commercial vaccines of single species alone desirable; preparing mixed vaccines, etc.); and vaccines of single species (staphylococcus and streptococcus vaccines).

A portion of the ninth and practically all of the tenth section of the article deals with infections peculiar to man.

A method for standardizing bacterial vaccines, J. G. HOPKINS (*Jour. Amer. Med. Assoc.*, 80 (1913), No. 21, pp. 1615-1617, fig. 1).—The method consists in measuring the volume of the moist bacteria after centrifugalization in a tube with a graduated capillary tip.

The importance of crows and foxes in the distribution of anthrax, F. MOLLET (*Centbl. Bakt. [etc.]*, 1. Abt., Orig., 70 (1913), No. 1-2, pp. 19-23; *abs. in Rev. Bact.*, 3 (1913), No. 4, p. 80).—In experiments in which anthrax bacilli and their spores were fed to crows (*Corvus corone*) and foxes (*Canis vulpes*) it was found that the bacilli could be cultivated from the feces when anthrax spores had been ingested. The experimental animals did not appear to be affected in any way.

Experimental insect transmission of anthrax, M. B. MITZMAIN (*Pub. Health Rpts. [U. S.]*, 29 (1914), No. 2, pp. 75-77).—In this preliminary note the author records three experiments in which both *Stomoxys calcitrans* and *Tabanus striatus* conveyed anthrax infection directly from infected to healthy guinea pigs.

Typical organisms were found in the feces of horse flies at various intervals up to 48 hours from the time the infected animal was bitten. "The accumulated deposits of 3 tabanids, 2 to 3 days after the infective bites, were injected in a saline suspension into a healthy guinea pig, which died of typical anthrax 4 days later. . . . The feces of the stable fly were likewise found to be infected up to 24 hours after obtaining blood from a sick animal. A nearly pure culture of anthrax was obtained from the droppings of 2 flies fed 24 hours previously on infected material."

In regard to the limits of infection in flies, an appended note states that since this article was written it has again been proved that *S. calcitrans* will transmit anthrax, and that bacilli may be found in the feces 14 to 17 days, inclusive, and positive cultures obtained from the stomach for 19 days. In the case of *T. striatus*, which sucked blood direct from the infected animal, bacilli were found in the feces for a period of 10 days.

In regard to combating anthrax, with particular reference to the examination of the vaccines, W. RICKMANN and K. JOSEPH (*Ztschr. Infektionskrank. u. Hyg. Haustiere*, 13 (1913), No. 7, pp. 402-438, figs. 7).—The results show that it is possible to determine the value of an anthrax immune serum with both rabbits and guinea pigs. From a technical standpoint, however, the guinea pig alone is suited for the exact titration of the serum. Anthrax serum (Höchst) was found to have a pronounced curative property for laboratory animals and the domesticated animals. For this purpose it seems advisable to give the first intravenous injection in conjunction with a subcutaneous injection of the serum. Smaller injections are then given subcutaneously as long as no typical fall in temperature is noted. In establishments where an epizootic is present the serum treatment is the only one which can be recommended.

The serovaccination method (serovaccine) elaborated by the authors has given good results both in laboratory experiments and in practice. The uniformity of serovaccine is dependent upon the method used in its preparation.

The diagnosis of echinococcus disease in man with the intradermal reaction, T. CASONI (*Folia Clin. Chim. e Microsc.*, 4 (1912), No. 3, pp. 5-16, figs. 2; abs. in *Ztschr. Immunitätsf. u. Expt. Ther.*, II, Ref., 6 (1913), No. 15, p. 1057).—For the test the hydatid fluid of living bovines is employed, and the reaction manifests itself by the appearance of erythematous spots with edematous infiltration of the skin, itching, and a local increase in temperature. The tests were made with 25 individuals, 8 of which were affected with echinococcus cysts and the remainder with various other diseases.

The melostagmin reaction for detecting echinococcus disease in bovines and sheep, P. SILVA (*Tierärztl. Zentbl.*, 35 (1912), No. 27, pp. 416, 417; abs. in *Ztschr. Immunitätsf. u. Expt. Ther.*, II, Ref., 6 (1913), No. 15, p. 1062).—The sera from 4 cows and 8 sheep which were infected with echinococcus disease gave a positive reaction with an alcoholic extract made from the membranes of the cyst or the cystic fluid. Ten sound cows and sheep gave negative reactions.

Complement fixation in Malta fever, A. MISSIROLI (*Policlin.*, Sez. Med., 19 (1912), pp. 414-421; abs. in *Ztschr. Immunitätsf. u. Expt. Ther.*, II, Ref., 6 (1913), No. 15, p. 1119).—While it was established that specific amboceptors were present in the sera of subjects affected with Malta fever, it was found, however, that the sera behaved differently as regards complement fixation with different *melitensis* strains. The test in its present form is thought to possess no real value as a diagnostic agent for this disease.

Cultivation of malarial plasmodia in vitro, C. C. BASS (*Amer. Jour. Trop. Diseases and Prev. Med.*, 1 (1914), No. 8, pp. 546-564, pls. 4).—A summarized account of the subject with references to the literature. See also a previous note (*E. S. R.*, 28, p. 179).

Further cultivation of the malarial parasites and of piroplasms (*Piroplasma canis*) in vitro, H. ZIEMANN (*Arch. Schiffs u. Tropen Hyg.*, 18 (1914), No. 3, pp. 77-93, fig. 1).—This paper reports upon studies conducted in continuation of those previously noted (*E. S. R.*, 30, p. 481).

Epidemic poliomyelitis and distemper of dogs, R. H. PIERSON (*Jour. Amer. Med. Assoc.*, 62 (1914), No. 9, pp. 678-680, figs. 2).—The author reports upon investigations made of a small epidemic of poliomyelitis among Indians of fishing villages in central Alaska near the town of Tanana on the Yukon River. In all there were a few more than 30 cases of the disease. The epidemic among human subjects was preceded by an epidemic of distemper among dogs, the symptoms manifested by the dogs being similar to those shown by the human subjects.

The author thinks that the theory that the disease is common to dogs and human beings fits so well the experience in epidemics which have taken place in different parts of the United States that it is well worth further investigation.

Information on the animal trypanosome diseases of German East Africa, H. BRAUN and E. TEICHMANN (*Arch. Schiffs u. Tropen Hyg.*, 18 (1914), Beiheft 1, pp. 39, pl. 1, figs. 2).—This report of the authors' studies includes a colored plate of the several trypanosomes concerned.

Trypanosomes found in wild *Glossina morsitans*, A. KINGHORN and W. YORKE (*Ann. Trop. Med. and Par.*, 7 (1913), No. 2, pp. 239-244).—"Trypanosoma *rhodesiense*? *T. ignotum*, and *T. pecorum* are transmitted by *G. morsitans* in nature, and were obtained by feeding wild, freshly caught *G. morsitans* on healthy monkeys."

Wild game as a trypanosome reservoir in the Uganda Protectorate, with some criticisms on the current methods of diagnosing these Protozoa, H. L. DUKE (*Arch. Protistenk.*, 32 (1914), No. 3, pp. 393-406).—The experiments here reported show that "the continued infectivity to monkeys of the wild *Glossina*

palpalis on the islands of Lake Victoria may be explained by the fact that the situtunga on these islands are acting as a reservoir to *Trypanosoma gambiense*. The continued infectivity of the mainland flies to *T. gambiense* may probably be explained on a similar hypothesis—not only situtunga but the other species of game also (i. e., water buck, bush buck, duiker, and reedbuck, buffalo, etc.) acting as a reservoir. No positive evidence can be adduced from the above experiments to show that hippopotamus can serve as a reservoir. The continued infectivity of the lake shore flies to *T. vivax* and *T. uniforme* is also due to the antelope which served as a reservoir for these trypanosomes.

"It has been shown that the buffalo and the hyena as well as the various antelope may carry trypanosomes which are pathogenic to cattle without themselves showing any signs of disease. Presumably elephant and the various Felidae may also act as a reservoir, and possibly many of the smaller mammals which abound throughout the country but which are seldom seen by man. In a state of nature such creatures, even if mainly nocturnal in their habits, must at times meet with tsetse, and however improbable it may seem that they may serve as a reservoir for the pathogenic trypanosomes, they must be borne in mind in considering the present problem. Until more is known concerning the habits of Glossina, it is justifiable to suspect any animal with which it may come in contact."

On the morphology and the retention of the trypanosomes found by P. Behn in German cattle, C. BONGER (*Ztschr. Hyg. u. Infektionskrankh.*, 75 (1913), No. 1, pp. 101-117, pl. 1, fig. 1; *abs. in Rev. Bact.*, 3 (1913), No. 4, p. 86).—The author believes the German trypanosome to be very closely allied to, if not identical with, *Trypanosoma theileri*. A bibliography of 20 titles is appended.

Some chemical conditions influencing acid-proofness and nonacid-proofness in a saprophytic culture of *Bacillus tuberculosis*, W. B. WHERRY (*Jour. Infect. Diseases*, 13 (1913), No. 1, pp. 144-154).—"During a study of the growth of a saprophytic culture of *B. tuberculosis* in various synthetic media, it was observed that the morphology varied from minute coccoid bodies to short or long, thick or thin, straight or curved rods which were or were not acid-proof according to the conditions of growth. The culture could be rendered nonacid-proof by continual growth under conditions unfavorable to the synthesis of fats. The culture could synthesize fatty bodies rendering it acid-proof when such substances as acetates were the source of carbon and nitrogen; or from various ammonium salts and propyl alcohol; or from NH_4Cl and mannit; or from NH_4Cl and levulose; or from glycerin and glucose in the presence of peptone.

"Various carbohydrates and the alcohol mannit were not attacked in the absence of phosphates. Various phosphates other than KH_2PO_4 favored fermentation, but acid-proof rods developed only in cultures containing NH_4Cl and levulose in the presence of potassium dihydrogen phosphate, calcium phosphate (secondary and tertiary), sodium biphosphate (primary), sodium pyrophosphate, and to a lesser degree in the presence of sodium phosphate (secondary). Under the conditions of the experiments the sporelike bodies produced were killed by heating to 60°C . for 30 minutes. That is, they were killed unless they require some very special conditions for germination.

"From the results of vital staining it seems reasonable to conclude that the chemical composition of these artificially produced acid-proof tubercle bacilli is different from that of virulent tubercle bacilli."

The branched forms of the tubercle bacillus, and immunity to tuberculosis, S. G. DIXON (*Jour. Amer. Med. Assoc.*, 60 (1913), No. 13, pp. 993-995, figs. 4).—After discussing the facts in regard to the involution forms of tubercle bacilli, especially the branched forms which are low in protective wax content, it is

suggested that such nonacid-fast forms of bacteria might possibly be used for immunizing purposes. They are also supposed to be less toxic than the other strains. By injecting living branched forms it is possible to produce a marked degree of immunity in guinea pigs. These facts are in accordance with the results obtained in clinical work with a watery extract and the suspension of degreased tubercle bacilli, which has been previously reported by another author.

A comparative study in regard to the resisting powers of the goat and guinea pig against the tuberculosis bacillus, G. SBARAGLINI (*Riv. Crit. Clin. Med.*, 13 (1912), No. 3, pp. 37-41; *abs. in Ztschr. Immunitätsf. u. Expt. Ther.*, II, Ref., 6 (1913), No. 15, p. 1109).—The experiments were made with a very susceptible guinea pig and a less susceptible goat and included the determination of the opsonic index and agglutination. The leucocytes of the goat destroyed the bacteria very readily in vivo and in vitro. In the guinea pig the leucocytic reaction was tardy and of a low order. The same differences were noted in the agglutination.

The blood findings in tuberculosis, LYDIA RABINOWITSCH (*Berlin. Klin. Wchnschr.*, 50 (1913), No. 3, pp. 110-112; *abs. in Jour. Amer. Med. Assoc.*, 60 (1913), No. 9, p. 703).—"A report [of a] research which apparently confirms the assumptions of Virchow and Orth, published 22 years ago, to the effect that an injection of tuberculin is liable to rout out the tubercle bacilli from their nests and drive them into the blood. In the numerous accounts that have been published in the last few months of the findings of the bacilli in the blood it is not stated whether the patients had been taking tuberculin or not. Bacmeister has recently stated that inoculation of animals with the blood from 15 tuberculous patients gave constantly negative results, but after 4 of the patients had been given a diagnostic injection of tuberculin with a distinct local reaction, then the inoculation of animals all gave positive results. He added that there can be no doubt that virulent bacilli had been driven out of the diseased organ into the circulating blood by the injection of tuberculin, and remarks that this is a pretty serious thing."

La pataleta: Some observations on a disease of stock observed in the southern territories of Argentina, J. M. QUEVEDO (*Bol. Min. Agr. [Buenos Aires]*, 14 (1912), No. 9, pp. 1030-1040, figs. 5).—This paper describes an affection of equines, bovines, and ovines which has been observed since 1907 in Patagonia. The disease resembles the enzootic paraplegia of sheep, previously described by the author (*E. S. R.*, 28, p. 183), but differs in the species and age of the animals attacked, the latter only occurring in adult sheep.

Scrapie, an obscure disease of sheep, S. STOCKMAN (*Jour. Compar. Path. and Ther.*, 26 (1913), No. 4, pp. 317-327).—This article relates to a fatal disease of sheep, which occurs on the borders of England and Scotland and is increasing in prevalence, but about which but little has been known until recently. It is characterized by intense itching, locomotor troubles, emaciation, and death in from 3 to 4 months. As a rule the active symptoms are not met with except in sheep over 18 months of age. When the disease is established on a farm the losses from it often amount annually to 4 per cent of the sheep and may be as high as 19 per cent. No remedy has been found up to the present time but experiments with curative treatment are under way.

Sheep dipping tanks.—An improved design for a circular tank, B. G. ENSLIN and W. S. H. CLEGHORNE (*Agr. Jour. Union So. Africa*, 7 (1914), No. 1, pp. 25-29, figs. 10).—A description and plan are given of a circular dipping tank.

The preparation of caustic soda and sulphur dip, A. D. SHILSTON (*Agr. Jour. Union So. Africa*, 6 (1913), No. 5, pp. 746-749).—"With proper care in

mixing, the chemical reaction between sulphur and caustic soda is practically complete, so that little or no free caustic soda remains in the liquid. Nonobservance of the directions may, however, lead to the production of a fluid containing considerable amounts of free caustic soda and little dissolved sulphur. Boiling the correctly mixed fluid causes after a short time the precipitation of sulphur, but unless continued for an hour or more this is not sufficient to weaken the fluid seriously, and in any case free caustic soda is not liberated by the process. Boiling the ingredients for 10 minutes is sufficient to complete the chemical reaction, even when the mixing has been improperly carried out, and is the surest means of producing a fluid of uniform composition. When the mixture is going to be boiled, it is not necessary to employ boiling water for mixing the sulphur paste, and more water may be added than when the mixture is not boiled."

The camel and its diseases: A review, J. M. KOWALEWSKI (*Jour. Méd. Vét. et Zootech.*, 63 (1912), Aug., pp. 462-466; Sept., pp. 540-549; Oct., pp. 600-613).—The first part of this work (pp. 462-464) deals briefly with the races of the camel in Russia; the second part with their diseases, including a preliminary study of bubonic plague in camels made at the bacteriological laboratory at Astrakhan.

Electrocardiogram of horse, A. D. WALLER (*Jour. Physiol.*, 47 (1914), No. 6, pp. XXXII-XXXIV, figs. 2).—The author having correlated the electrocardiogram with the pressure changes finds "that in the horse, as in man, the first and second ventricular waves V_I and V_{II} (or according to the now prevalent rubric R and T) correspond very nearly with the beginning and end of the ventricular systole, or with the first and second sounds."

Investigations of the lateral cartilages (Cartilagine unguæ) of horses, M. LUNGWITZ and H. ERLE (*Anat. Anz.*, 43 (1913), No. 12-13, pp. 313-326, figs. 8; abs. in *Jour. Roy. Micros. Soc.* [London], 1913, No. 3, p. 280).—The authors' histological studies of the lateral cartilages led to the conclusion that they are always fibrous and not hyaline.

Researches on the ascarid toxin, M. WEINBERG and A. JULIEN (*Hyg. Viande et Lait*, 7 (1913), No. 5, pp. 225-244, figs. 2).—This is a report of investigations conducted in continuation of those previously noted (*E. S. R.*, 25, p. 590).

The instillation of the ascarid (*Ascaris megalocephala*) toxin into the horse's eye produced a local reaction characterized by edema of the eyelids, congestion of the conjunctiva, and lachrymation in 168, or about 66 per cent, of the 256 horses tested. Sometimes the local reaction was accompanied by more serious symptoms, including dyspœna, diarrhea, and profuse perspiration. The ocular reaction appears quickly and lasts from 12 to 24 hours, but the general symptoms, at times very threatening, disappear in 2 or 3 hours. The action of the toxin following the instillation of the perienteric liquid is variable, some worms having strong toxins while others have weak ones. The ocular reaction may even be produced by the toxin at a dilution of 1:5,000. The perienteric liquid is dependent for its action upon a series of active substances. According to Flury's investigations "its poisonous action is due to aldehydes, fatty acids, and their esters. The toxin is thermostable, passes the Chamberlain filter, and is partially dissolved in alcohol and ether. Its volatile products are also toxic.

Horses infested by ascarids are immunized by degrees against the action of toxins secreted by these parasites. The instillation of perienteric liquid usually does not produce an ocular reaction in them. The serum of infested horses contains specific antibodies capable of neutralizing in vitro very weak dilutions of the ascarid toxin. Among the other intestinal parasites of the horse the

sclerostome alone secretes a substance capable of producing an ocular reaction; this reaction is less frequent and weaker than that produced by the perienteric liquid of the ascarid.

Locust poison, W. G. COOK (*Vet. Alumni Quart. [Ohio State Univ.]*, 1 (1913), No. 2, pp. 54, 55).—A report of the fatal poisoning of 2 horses, caused by chewing the inner bark of a locust tree (*Robinia pseudacacia*) to which they had been hitched.

The vector of mal de caderas, F. W. URICH (*Proc. Agr. Soc. Trinidad and Tobago*, 1914, No. 1, pp. 8, 9).—In his discussion of the probable intermediate agent in the transmission in Trinidad of this disease of the horse, the author states that the stable fly (*Stomoxys calcitrans*) occurs all over the island. A hematophagous bug, *Triatoma geniculatus*, which may possibly convey the trypanosome, is said to occur in Trinidad as well as in Brazil.

The occurrence of distomes in the intestine of the dog at Montpellier, G. R. BLANC and H. HEDIN (*Compt. Rend. Soc. Biol. [Paris]*, 74 (1913), No. 15, pp. 884, 885; *abs. in Rev. Bact.*, 3 (1913), No. 4, p. 87).—The authors report the discovery of fluke parasites in the intestines of 2 of 50 dogs examined in Montpellier. The parasite, which is very small, appears to be a new species and has been named *Echinostoma piriforme*.

Controlling chicken pox, sore head, or contagious epithelioma by vaccination, F. B. HADLEY and B. A. BEACH (*Proc. Amer. Vet. Med. Assoc.*, 50 (1913), pp. 704-712, pl. 1; *Amer. Vet. Rev.*, 44 (1913), No. 3, pp. 330-339, fig. 1).—Chicken pox and roup are believed to be the same disease manifesting itself in different forms. Repeated success was attained in transmitting the disease by subcutaneous inoculation of a few drops of a normal salt solution of the virus made by macerating the comb and wattle tissue from birds showing well-marked lesions of sore head, although the disease could not be produced by this method every time.

The incubation period varied from 3 to 20 days and diphtheritic membranes frequently appeared on the nasal, oral, and conjunctival surfaces when the virus was placed on them or injected subcutaneously. The involved epithelium of the comb showed an increase in the size of the epithelial cells, which appeared to contain inclusions and inflammatory changes in the deeper layers.

In the treatment of the disease autogenous vaccines gave very satisfactory results. "Best results were obtained by two doses. The vaccine is especially applicable in large commercial and valuable breeding flocks when used before pathological changes become marked. The vaccination treatment for chicken pox was most valuable when used as a preventive, where it was effective in fully 98 per cent of the cases. One attack conferred immunity. The immunity which resulted from the vaccination is estimated to be effective for 1½ to 2 years.

"It was found impossible to transmit the disease at every attempt due to certain peculiarities of the virus and the fowls. When the attempts were successful the disease ran a benign course, as it also did in the few cases in which it made an appearance after vaccination. Experiments to show that chicken pox is caused by a filterable virus resulted negatively.

"Although the identity of chicken pox and roup has not been definitely proved, the similarity of these diseases is so great that it seems possible to control roup by vaccination."

Edema of the wattles of fowls due to an organism of the Pasteurella group, H. R. SEDDON (*Vet. Jour.*, 70 (1914), No. 463, pp. 24-34, figs. 5).—This paper has been summarized by the author as follows:

"The breed affected in the cases under review was White Leghorn, but probably any breed with large wattles would be liable to the complaint. It has

been produced experimentally in other breeds of fowls. In natural cases or following scarification and rubbing in of culture the first symptom noticed is the rapid swelling of the wattles, due to the presence of edema, which may also be found exuding from the surface. Septicemia and death occurs in a certain percentage of cases. The disease usually runs a chronic course with subsequent replacing of the fluid by fibrous tissue, formation of nodules of necrotic material, and results in the wattle assuming a crinkled appearance. The cause is a *Pasteurella*, apparently identical with that causing chicken cholera. It produces a septicemia with early death on inoculation into pigeons and rabbits. Entrance is probably through wounds obtained while scratching, fighting, etc. Immunity is attained in chronic cases, which, however, are probably capable of acting as 'carriers.'

The cases amenable to treatment by "cropping" of the wattles and the adoption of sanitary measures of benefit in suppression of the disease are also discussed.

Enteritis of birds caused by *Bacillus paratyphosus* B, R. MANNINGER (*Centbl. Bakt. [etc.], 1. Abt., Orig., 70 (1913), No. 1-2, pp. 12-14; abs. in Rev. Bact., 3 (1913), No. 4, p. 78*).—An epidemic of enteritis among song birds of the finch tribe in the zoological gardens at Budapest was found to be caused by *B. paratyphosus* B which is considered to be very closely allied to *B. psittacosis*.

Some external parasites of poultry, H. E. EWING (*Oreg. Agr. Col. Bul. 92 (1913), pp. 16, figs. 12*).—A brief popular account of the more important external parasites of poultry.

RURAL ENGINEERING.

Engineering principles applied to farm irrigation, A. L. HARRIS (*Engin. News. 70 (1913), No. 24, pp. 1172-1175, figs. 5*).—This article calls attention to the present day importance of cooperation between the agricultural engineer and the irrigation farmer. It describes the systematic arrangement and equipment of a farmer's irrigation ditches, taking up topographic survey and map; soil survey; design and equipment of water conducting system to withstand erosion and so far as possible to be self-cleaning; and improvements to reduce labor, facilitate the operation of irrigating and effect economy of water, time, and land area.

Flow of water in pipes, E. A. MORITZ (*Engin. Rec., 68 (1913), No. 24, pp. 667-670, fig. 1*).—The author presents a new formula and describes its applications to flow in wood-stave, cast iron, riveted steel, and concrete conduits. For wood-stave pipe the formula is $Q = 1.35 D^3 \cdot H^{0.555}$ and is the same for cast iron and riveted steel, except that coefficients of 1.31 and 1.18 respectively are used in place of the coefficient 1.35. Q equals the discharge in second-feet, D equals the diameter of pipe in feet, and H is the friction loss per 1,000 feet of pipe.

Wet-mix concrete pipe are classed with the cast iron pipe, and dry-mix concrete pipe with the riveted steel pipe. Comparisons of this formula with those in standard use show the results to be nearly identical, and it is stated that the cumbersome use of many coefficients is eliminated.

Irrigation practice, J. S. WELCH (*Idaho Sta. Bul. 78 (1914), pp. 27, figs. 9*).—This bulletin points out briefly the character of work in irrigation practice at the station and reports the results so far obtained by irrigation investigations, and the results of soil management experiments in so far as they relate to the duty of water. A summary of results indicates the following:

"In the preparation of new lands for irrigation farming careful attention should be paid to proper leveling. . . . Alfalfa should be irrigated by the corru-

gation method during its first season, after which flooding between borders is more satisfactory in most cases. In the production of alfalfa hay seven or eight irrigations should be given in a three crop season, totaling about $2\frac{1}{4}$ acre-feet per acre. The moisture supplied by winter and spring precipitation is usually sufficient to carry winter wheat to the booting stage, after which one or two irrigations totaling less than one acre-foot per acre should be given. Flooding between borders is a desirable method of application.

"In the irrigation of spring wheat, oats, and barley care should be taken to have a comparatively high soil moisture content at the jointing, booting, and soft dough stages. The water can be applied to advantage by flooding between borders," using in all $1\frac{1}{2}$ to $1\frac{3}{4}$ acre-feet per acre in about 4 applications. The irrigation of potatoes should commence about the time the tubers begin to form. During the next 5 or 6 weeks about 4 irrigations should be given, applying in all about $1\frac{3}{4}$ acre-feet per acre, the early irrigations being followed by cultivation.

"The improvement of sagebrush lands by the addition of barnyard manure and by the growing of leguminous crops will result in a saving of water. . . . The growing of diversified crops is one of the most efficient means by which the duty of water can be increased."

Irrigation in South Africa, A. C. CARBARNES (*Agr. Jour. Union So. Africa*, 6 (1913), No. 4, pp. 638-644).—Practical irrigating methods are described and suggestions given for the use of the beginner in laying out a field for irrigation.

Report and plans for reclamation of lands subject to overflow in the Embarrass River Valley, J. A. HARMAN (*Ill. Geol. Survey Bul.* 25 (1913), pp. 61, pls. 9).—The plans included in this report, propose (1) straightening the crooked channel; (2) building adequate levees to allow floodwater movement without its covering farm land; (3) excavating ditches for the diversion of hillside water; and (4) installing pumping stations to care for the drainage of each unit area during times of flood. The estimated average cost of the work is \$30 per acre, the benefit derived from such improvements being considered to exceed the cost.

Testing drain tile and sewer pipe, M. SCHUYLER (*Engin. Rec.*, 68 (1913), No. 25, pp. 695-697, figs. 3).—An analysis of theoretical considerations relative to the testing of drain tile led to the following conclusions:

All failures of tile are the results of overstressing in tension some generally elemental section. When tile vary from piece to piece as much as 100 per cent a demand for a sensitivity of 10 per cent in the load indicating details would seem sufficient. This could be obtained readily and accurately by a spring dynamometer and Ames dial gage. Since only the more perfect of the cement tiles allow a continuous contact between a rigid platen and the tile, either a plaster bearing or some flexible platen such as sand or water should be used. Tile should be tested individually to determine their ability to sustain the loading superimposed by particular ditch conditions. This procedure would necessitate a portable machine and considerable labor, but would amply repay this effort under extreme conditions.

Drilling as a test for concrete, C. S. DUKE (*Engin. Rec.*, 68 (1913), No. 24, pp. 670, 671, figs. 3).—Data and results are given of experiments made to determine the relation between compression strength and speed of boring in concrete. It is stated that "all things being equal the rate of boring concrete would in a general way vary inversely as the compressive strength," but it is concluded that the drilling furnished a very unreliable criterion as to the character of the concrete on account of the variation in the age of the concrete, the personal

equation of the drillers, and the condition of the drill as to sharpness and dullness.

[Standard tests for brick] (*Brick and Clay Rec.*, 43 (1913), No. 3, pp. 272, 273).—Specifications are given, as suggested by the American Society for Testing Materials, which cover transverse, freezing, compression, and absorption tests and classification and sampling for vitrified and hard burned brick and common brick first and common brick second.

The part played by water in macadam road construction, W. G. FEARN-SIDES (*Surveyor*, 44 (1913), No. 1141, pp. 808-811, fig. 1).—The author deals with the limitations of water as an essential constituent in macadam road construction, taking up the chemical disintegration of road stones, physical characteristics of water in roads, behavior of water-bound materials, the tensile and crushing strength of road stone, potholes, foundation stone, subcrust dew, and frost. The conclusions point to the importance of surface and under drainage for roads, and to the fact that each and every road aggregate has a characteristic optimum water proportion for efficient service.

Reinforced concrete bridges, F. RINGS (*New York*, 1913, pp. XI+183, pls. 8, figs. 365).—In this book it has been attempted to collect as much data and material as possible relating to the design of reinforced concrete bridges, and to publish the most important features and facts with which the designer of bridges should be acquainted. The subject matter is presented under the following chapters: Bending moments, stresses, and strains; loads on bridges and external stresses; culverts, covering, tunnel, etc.; beam bridges; calculation of girder bridges with examples; design of arched bridges and abutments, with examples; theory of the arch; and formulas, notes, schedules, and useful information.

Use of wind motors in Egypt, DELACROIX-MARSY (*Bul. Union Agr. Égypte*, 10 (1912), No. 91, pp. 269-278; 11 (1913), No. 97, pp. 142-153).—This article discusses the generalities of the problem of the utilization of wind power in Egypt and its possibilities, particularly for pumping for both drainage and irrigation. Results of irrigation experiments led to the conclusion that this method may be employed in the spring in Upper Egypt in places where the wind is strong and blows daily, and that under certain conditions wind power may be applicable for drainage pumping in Lower Egypt.

Central [electric] station practice of Windsor, Vt. (*Elect. World*, 62 (1913), No. 23, pp. 1153-1159, figs. 20).—This article describes the development of a small electrical central station system, supplying electricity to a manufacturing and rural community in the upper Connecticut Valley. Several typical private installations supplied with power by this system are illustrated and described.

Lighting costs 15 cts. per kilowatt hour up to an energy consumption of 20 kilowatt hours per month, with a reduction in steps down to 6 cts. minimum for over 350 kilowatt hours. Motor service prices have a base rate of 7½ cts. per kilowatt hour, discounted by 10 per cent steps up to 50 per cent off for users of 2,000 kilowatt hours per month. The minimum charge for both lighting and motor service is \$1 per month.

Experiments in electro-culture near Dayton, Ohio, H. G. DORSEY (*Elect. World*, 62 (1913), No. 24, pp. 1217, 1218, fig. 1).—In experiments conducted to determine the effect of electricity and artificial illumination on growth of vegetation, the plats subjected to high-frequency electrification showed a greater increase in yield than any of the others. Ruby light ranged second for radishes, while violet light was second for lettuce. The edible portion of lettuce grown on the high-frequency plat was 75 per cent greater than under natural conditions. Tests of high-frequency electrification on a larger scale showed an increase in all garden crops except beans and peas.

Motor plow test of the German Agricultural Society, B. LICHTENBERGER (*Deut. Landw. Presse*, 40 (1913), No. 86, pp. 1027-1029, figs. 11).—Nine different outfits were entered in this contest, 1 wire cable 2-engine outfit, 5 outfits with the tractor and plow separate, and 3 with combined tractor and plow. In the main competitive tests fuel, water, and lubrication consumption; speed and efficiency of operation; width and depth of furrow, etc., were determined. These were followed by a duration test under different conditions of soil and atmosphere.

All the outfits but one finished the duration test in good condition, but many defects were noted in each. Two of the engines in systems having the engine and plow separate did very good work in stony ground with moldboard plows, especially the so-called "caterpillar" tractor. Likewise another such system with moldboard plows and also a cable-drawn balance plow did good work under poor conditions of soil.

It is concluded from the results obtained that each of the three systems has a practical application for certain conditions.

A year of mechanical cultivation, R. BARENNES and H. DE MARSAY (*Bul. Soc. Agr. France*, 1913, Nov. 1, pp. 230-239).—This reports a year's results of mechanical cultivation operations in the domain of Béguère, which indicate the practicability, in conditions analogous to those of Béguère, of introducing mechanical power to replace the scarce and poor manual labor.

Test of a refrigerating plant, J. REZEK (*Mitt. Landw. Lehrkanz. K. K. Hochsch. Bodenkul. Wien*, 2 (1913), No. 1, pp. 1-16, pl. 1).—A sulphur dioxide refrigerating plant for dairies is described and diagrammatically illustrated. Tests of this plant indicate its refrigerating and ice-forming capacities and its efficiency for the direct cooling of milk.

A test of a cooling apparatus for cooling fresh milk in milk cans, R. EICHLOFF (*Ztschr. Landw. Kammer Braunschweig*, 82 (1913), No. 30, pp. 364-366, figs. 3).—A simple milk cooling apparatus is described consisting of two parts, a tank opening at the bottom into an open ended pipe and a second but smaller tank opening at the bottom into a closed end pipe with a star section. The first part is placed on the second part, fitting loosely, and the whole is placed on a can of milk so that the two tanks are outside and the pipes extend to the bottom of the can. The upper tank is filled with water which flows down the pipe, out into the pipe with star cross section, back up into the second tank, and over the outside of the milk can, thus effecting a double cooling inside and outside.

Tests of this apparatus indicate its simplicity and practicability for the rapid cooling of milk for immediate commercial purposes, and show that three times filling of the upper tank with water results in a suitable temperature of the milk in about 30 minutes.

[**Farm house heating**], **A. A. POTTER** (*Country Gent.*, 78 (1913), No. 46, pp. 1676-1678, figs. 3).—This article describes and diagrammatically illustrates simple systems of hot air, hot water, and steam heating for country homes, and points out the chief factors to be considered in the selection, installation, and manipulation of a system.

Ozone water-purifying apparatus (*Elect. World*, 62 (1913), No. 24, pp. 1231, 1232, fig. 1).—Two types of small ozone water purifiers are described, one for use in residences and the other for factories. A filter is a necessary adjunct of the ozonizing apparatus in places where the water is turbid.

Water, its properties and practical uses.—XX, [The septic tank system], F. W. TOWER (*Dom. Engin.*, 65 (1913), No. 9, pp. 270, 271, figs. 2).—This article presents the theory of operation of a septic tank in concise form and

gives suggestions for the installation of a residential plant consisting of three chambers, a grit chamber, a settling compartment, and a discharge chamber. Final disposal by discharging into an underground pipe absorption system is recommended where possible, but when the soil is wet, heavy, or of a clay nature, it is suggested that the contents of the discharge chamber be siphoned into an underground filter of broken stone and gravel and from there to a second filter of sand. From this it is necessary to pump the filtered water at stated intervals.

Water, its properties and practical uses.—**XXI**, [Installation of house and subsoil drains and cellar drainers], F. W. TOWER (*Dom. Engin.*, 65 (1913), No. 12, pp. 368-371, figs. 3).—This article deals with the design and installation of house sewer plumbing and diagrammatically illustrates and describes subsoil drains and cellar drainers. A velocity of 275 ft. per minute is considered desirable in house drains in order to clear all drains of solids and refuse.

Septic tanks and sewage disposal (*Dom. Engin.*, 65 (1913), No. 11, pp. 330-334, figs. 16).—The subject of sewage disposal is reviewed and the operation of septic tanks and disposal systems briefly described.

School hygiene, F. B. DRESSLAR (*New York*, 1913, pp. XI+369, figs. 51).—The topics discussed in this book cover nearly the whole field of school sanitation and the health of school children, among the more prominent being those dealing with the location, construction, and equipment of school buildings, common physical defects and need of medical inspection of school children, and recent pedagogical theories regarding play, home work, etc. While many of the statements refer chiefly to city schools, many others apply equally to rural schools, and the water supply and sanitary equipment of the latter are especially discussed.

Experiments in school room ventilation with reduced air supply through individual ducts, F. BASS (*Heating and Ventilating Mag.*, 10 (1913), No. 8, pp. 16-24, figs. 11; *Amer. Jour. Pub. Health*, 3 (1913), No. 11, pp. 1135-1137).—The results of an experiment on the recirculation of air and the use of ozone in school ventilation indicate that in an average school recirculation and renewal of the air for three weeks is an esthetic and hygienic possibility and will effect heating economy.

Some preliminary studies in air washing and its results, G. C. and M. C. WHIPPLE (*Amer. Jour. Pub. Health*, 3 (1913), No. 11, pp. 1138-1153).—Experiments in air washing showed that about two-thirds of the suspended particles, including dust, bacteria, and molds, were removed by this process. It is believed that air washing is one of the vital elements of ventilation in localities where a clean supply of air is difficult to obtain, and that the recirculation of such air is deserving of serious consideration from the standpoint of heating economy, especially in cold climates.

Concrete garbage burners (*Irrig. Age*, 29 (1913), No. 2, p. 52, figs. 2).—Two small concrete garbage burners for use on the farm are illustrated and briefly described.

RURAL ECONOMICS.

The census methods of the future.—Agricultural statistics, E. D. DURAND (*Quart. Pubs. Amer. Statis. Assoc.*, n. ser., 13 (1913), No. 104, pp. 568-573).—The author concludes that it seems desirable in the future to employ the rural mail carrier to collect federal agricultural statistics; to obtain annually by actual enumeration the numbers of domestic animals and the acreage and production of the principal crops; to distribute part at least of those inquiries which need to be asked only at decennial intervals among the individual years of the

decade; and to rely upon data from selected farms for most information regarding values.

[The manufacturing industry and its relation to agriculture] (*Thirteenth Census U. S., 10 (1910)*, pp. 319-434, 469-508, 573-585, 677-694, figs. 12).—This volume of the census contains data for 1869-1909 showing the number of establishments, persons engaged in the industry, primary horse power, capital, expenses, values of products, and value added by manufacturing, materials used, and products manufactured for the following industries: Agricultural implements, butter, cheese, and condensed milk, canning and preserving, flour mill and gristmill, glucose and starch, rice cleaning and polishing, sugar, lumber, fertilizers, turpentine, and rosin.

The agricultural implement industry (*Thirteenth Census U. S., 10 (1910)*, pp. 321-330).—According to the census returns between 1889 and 1909 the number of establishments manufacturing agricultural implements decreased from 910 to 640, but the number of wage earners increased from 38,827 to 50,551, the horse power used from 50,395 to 100,601, and the value of products from \$81,271,651 to \$146,329,268. Among the statistical tables shown is one giving the number of principal kinds of implements manufactured in 1899, 1904, and 1909.

The Oregon farmer (*Portland, Oreg., 1913*, pp. 136, figs. 19, pl. 1).—This book, prepared by the Oregon State Immigration Commission, contains a series of articles relating to agriculture in Oregon, based partially upon original inquiries and partially upon other official records, and describes the live stock, dairy, and poultry industries, soil, climate, fruit and farm crops, farm finance, and rural life of the State.

[Brazil's trade in agricultural products], P. DE TOLEDO (*Introduc. Relat. Min. Agr., Indus., e Com., Brazil, 1913*, pp. XCII).—This report gives statistics relating to immigration and the principal agricultural products imported and exported.

Statistics of the production of cereals and legumes (*Estadística de la Producción de Cereales y Leguminosas. Madrid: Junta Consult. Agron., 1913*, pp. [28]).—This report contains data relating to the area and production of cereals and legumes by regions and provinces of Spain for 1913, and by regions only for 1909 to 1913.

[Agricultural and pastoral statistics for Queensland], T. SHACKEL (*Ann. Rpt. Dept. Agr. and Stock [Queensland], 1912-13*, pp. 126-184, pls. 15).—Data are given relating to the principal classes of live stock and the areas and production of the principal crops for 1903 to 1912, and to dairy products for 1908 to 1912.

British rural life and labor, F. G. HEATH (*London, 1911*, pp. XI+348, fig. 1).—The author discusses the general system of labor; extras, piece work, and allowances in kind; and earnings, food, and migration of agricultural laborers in England, Wales, Scotland, and Ireland. Tables are included showing the earnings and the quantity and value of the food consumed and describes some typical conditions.

Report on the decline in the agricultural population of Great Britain, 1881-1906, R. H. REW (*Ed. Agr. and Fisheries [London], Rpt. Decline in Agr. Pop. Gr. Brit., 1881-1906*, pp. 143, pl. 1, figs. 2).—This report contains abstracts from the replies of 248 agricultural correspondents regarding the changes that have taken place in the agricultural population since 1901, the causes of the decline in agricultural population, and the extent to which changes in the systems of farming have affected the demand for laborers. Statistical tables are included for 1881, 1891, and 1901, showing by counties the number of the various types of agricultural workers, the area of arable land and permanent pasture

and the number of cattle and sheep, and for 1885, 1895, and 1905 the number of agricultural holdings.

General outline of the new Russian land reforms (*Internat. Inst. Agr. [Rome], Mo. Bul. Econ. and Soc. Intel.*, 4 (1913), No. 2, pp. 119-134, pl. 1; 5 (1914), No. 1, pp. 132-160, pl. 1).—This article outlines the history of the land reform movement beginning with 1861, the work of the land commissions appointed under the law of 1906, the extent of the readjustment of peasant holdings, and the influence of the Peasants' Land Bank, in financing the movement. An extensive bibliography is included.

The national forward-to-the-land league ([*Boston, Mass., 1913*], pp. 1-8).—According to this report the purpose of this league is to enlist public-spirited capitalists in investing in agricultural land contiguous to their own city at a low rate of interest and to equip it for occupancy to relieve the congestion in the great cities. It also aims to educate those placed on the land in intensive cultivation methods.

Agricultural credit.—Land mortgage or long-term credit (*U. S. Senate, 63. Cong., 2. Sess., Doc. 380 (1914), pp. 73*).—This document contains a description and analysis of long-term credit as found in European countries with modifications deemed necessary to meet conditions in the United States. It also contains an interpretation of the legislation suggested and a statement of the considerations which have influenced the United States Commission on Rural Credits in submitting a bill for a national farm land bank system which is appended.

The agricultural credit in the kingdom of Bohemia, A. BLAŽEK (*Prague, 1913, pp. 3, pl. 1*).—From a study of the history and present condition of agricultural credit in Bohemia the author concludes that in the future there should be a closer organization through the union of the Raiffeisen cooperations, the district farmers' loaning banks, and the Mortgage Bank.

The land credit question in German East Africa, RHODE (*Verhandl. Kolon. Wirtschaftl. Kom., No. 1 (1913), pp. 39-47*).—This article describes the organization of the Southwest African Land Credit Association and its relation to the agricultural development of the colony, and contains comments by Hupfeld and Schwarze.

The need of community cooperation in crop production and marketing, H. L. BOLLEY (*N. Dak. Farmer, 15 (1914), No. 8, pp. 4-7*).—The author concludes that the farmers in certain large commercial crop-growing regions should so handle their crops that each particular region may become a center of production for a certain particular variety of a crop.

Bureau of marketing, E. J. WATSON (*Ann. Rpt. Comr. Agr., Com. and Indus. S. C., 10 (1913), pp. 224-240*).—By listing in a weekly paper persons having farm products for sale and those desiring to purchase the commissioner is endeavoring to find a market for the farm products of his State without any other medium of exchange.

Forest insurance in Norway (*Internat. Inst. Agr. [Rome], Mo. Bul. Econ. and Soc. Intel.*, 4 (1913), No. 9, pp. 47-55).—This article contains a discussion of the extent and value of the forests in Norway, the fire preventive measures used, and the organization of the Norwegian Mutual Forest Fire Insurance Society, and reports the results of the first year of its work.

A Norwegian forest fire insurance association, J. A. LARSEN (*Forestry Quart., 11 (1913), No. 4, pp. 525, 526*).—An account of the organization and results of this work, also noted above.

The insurance of cattle in France, L. HÉRONNAUX (*Jour. Soc. Roy. Cent. Agr. Belg., 61 (1913), No. 2, pp. 42-49*).—The author discusses the influence of local conditions in fixing rates and the relationship of the local associations to

the central organization and gives a brief summary of the growth of this type of insurance in France.

A system of farm cost accounting, C. E. LADD (*U. S. Dept. Agr., Farmers' Bul.* 572 (1914), pp. 15).—This bulletin aims to give a description of a system of farm accounting which has been used for three years in the State of New York on 53 farms under widely different conditions, and describes in detail the methods employed in making the inventory, the financial record, the working record, the classification of farm products and seed, and in closing the account at the end of the year. Each phase of the accounting is illustrated with a sample entry.

Children or cotton? L. W. HINE (*Survey*, 31 (1914), No. 19, pp. 589-592, figs. 7).—The author in this article discusses the employment of child labor in cotton picking and the influence upon the child and suggests possible methods that might be used to prevent its use.

The American Red Cross rural nursing service (*Washington, D. C.*, [1913], pp. 8).—This service is organized to enable rural communities to have the advantage of a trained nurse similar to that found in the cities. This pamphlet contains suggestions for the organization of a local nursing association, and outlines the duties, by-laws, methods of financing, and regulations for rural nurses.

AGRICULTURAL EDUCATION.

The Development Fund and its distribution, R. HART-SYNNOT (*Jour. Farmers' Club* [London], 1912, Nov., pp. 103-126).—This paper concerning the establishment of the Development Fund and the plans under which it is being distributed was read before the Farmers' Club and discussed by its members.

Memorandum as to the constitution of the advisory councils for agricultural education in England and of the agricultural council for Wales (*London: Bd. Agr. and Fisheries*, 1913, pp. 11).—Detailed information is given in regard to the form of constitution agreed upon for each of the 9 advisory councils for England and 1 in Wales to promote the organization of the different forms of agricultural instruction which are not carried on within an agricultural education institution.

Higher education in agriculture, veterinary science, forestry, and horticulture in Prussia (*Jour. Bd. Agr.* [London], 20 (1913), No. 9, pp. 761-773).—This article gives a description and outlines the history of the development of various university and other agricultural institutes, and explains how the students of the higher agricultural institutions are recruited in view of the fact that there is no educational ladder connecting them with the lower branches of agricultural education.

Agricultural instruction under the chamber of agriculture (*Jahresber. Landw. Kammer Stettin, Prov. Pommern*, 1912, pp. 77, 78, 83, 84, 96-109).—This is a report on the work in 1912-13 of the agricultural and home economics schools in general and individually, and on special courses and itinerant instruction under the Chamber of Agriculture of Pommerania.

The school of agriculture of Grignon, L. BRETIGNIERE (*Vie Agr. et Rurale*, 2 (1913), No. 15, pp. 405-409, figs. 4).—The history of the National School of Agriculture of Grignon and its estate is reviewed, and a description given of its practical instruction.

Agricultural instruction for women, D. ZOLLA (*Vie Agr. et Rurale*, 3 (1914), No. 8, pp. 201-203).—The author discusses briefly facilities for instruction in agriculture and home economics for women in Belgium, England, and France.

Agricultural training in the high schools of Nebraska (*Lincoln, Nebr.: Dept. Pub. Instr., 1913, pp. 15, fig. 1*).—This pamphlet contains a copy of the 1913 law providing state aid for agricultural instruction in Nebraska high schools, followed by rules and regulations, and the outlines of 2-year and 4-year courses of study for state-aided rural consolidated, county, and city high schools and of a suggested line of agricultural work for rural schools that may become associated with such approved high schools.

Industrial schools (*Ann. Rpt. Reforms and Prog. Chosen (Korea), 1911-12, pp. 207, 208, 239, 249-255*).—Under the new educational system in Korea, which went into effect in August, 1911, the higher industrial schools may be classified as agricultural, commercial, and technical. At the end of the fiscal year 1911 the industrial schools numbered 19, including 1 agricultural and dendrological school and 15 agricultural schools. There were also 17 elementary industrial schools, of which 13 gave agricultural training and 2 agricultural and commercial training. In the common schools 2 hours a week are devoted to nature study in the third and fourth years. Instruction in elementary agriculture is not compulsory and the time allotted to it may be fixed by the teacher after obtaining the approval of the governor of the province. In the normal course in a higher common school 3 hours a week are devoted to materials for teaching nature study, and in an agricultural school, which offers a 3-year course, generally 10 hours a week the first year and 18 the second are devoted to agricultural subjects out of a total of 30 hours a week.

School manual training practically applied, W. C. DENNIS (*Farmer, 32 (1914), No. 6, pp. 172, 188, figs. 3*).—An account is given of the construction of a model poultry house by the manual training students of the Litchfield, Minn., high school.

Boys' and girls' agricultural clubs in Michigan (*Mich. Farmer, 142 (1914), No. 5, pp. 105, 106, fig. 1*).—A summary is given of a plan for the organization of boys' and girls' clubs throughout the State of Michigan. This is followed by a description of the work done by the Wexford Boys' and Girls' Agricultural Club, which has been in existence for several years.

Agricultural clubs in the high schools of Utah, A. C. CARRINGTON (*Univ. Cal. Jour. Agr., 1 (1913), No. 5, p. 29*).—Within the last year the agricultural club of the Utah College has organized 14 agricultural clubs in the high schools of the State. Arrangements have been made whereby college extension workers and prominent men in the State deliver one lecture a month on an agricultural subject at each club. The work of the clubs this year includes stock and grain judging contests, and some of the clubs have held debates with one another. One club received sample seeds from seed houses in the State, constructed hot-beds and frames, and carried on experiments with seeds and plants in the classrooms. The matured plants were sold, the receipts totaling \$40. Club libraries are also being encouraged.

Wheat competitions in Western Australian schools (*Queensland Agr. Jour., n. ser., 1 (1914), No. 1, pp. 16-20, figs. 2*).—A competition in wheat growing is described in which 3 prizes were awarded for the production of the most grains from an original single grain. The education department supplies tools, fencing, and seeds of flowers, vegetables, and economic plants for gardening lessons in the state schools. Many of these materials are provided by the agricultural department while trees and shrubs are obtained through the forestry department.

Elementary agriculture, G. S. RAYMOND (*Hawaii Ed. Rev., 2 (1914), No. 1, pp. 12, 13, 16*).—This is a suggested outline, prepared by the territorial inspector of schools, of a course in elementary agriculture for the fifth to the eighth grades, inclusive.

Some principles of agriculture (*Hartford, Conn.: Bd. Ed., 1913, pp. 29, figs. 15*).—This is a collection of 23 experiments, gathered from various sources, in plant production, the porosity of an egg, and the length of time required for a hen to molt, followed by an article on Judging Dairy Cows by E. B. Fitts.

Farm animals and farm crops, W. L. NIDA (*Chicago, 1914, pp. VI+238+VII-CLXIX, pl. 1, figs. 114*).—This is the same text as the author's Elementary Agriculture previously noted (*E. S. R., 30, p. 598*), with the exception of the addition of a chapter on boys' and girls' clubs and the substitution of 1,000 questions in agriculture and the answers for questions relating to each chapter of the text.

Bulbs: Their selection and best method for planting, MARY T. RONAN (*Rural Educator, 3 (1914), No. 2, p. 27*).—The author describes the planting of 250 hyacinth bulbs in boxes by each class of her school.

The story of wool, SARA W. BASSETT (*Philadelphia, 1913, pp. 213, pl. 1, figs. 5*).—An account is given of the procedure on a sheep farm told in the form of juvenile fiction.

Farm machinery laboratory manual, D. SCOATES (*Agricultural College, Miss., 1913, pp. 48*).—Laboratory exercises in studying farm machinery in use at the Mississippi College are outlined.

Libby's road primer, H. W. LIBBY (*Eugene, Oreg., 1913, pp. 16, figs. 4*).—This primer gives directions for preparing a map and report on a piece of road to be improved, treating earth and sand roads, draining, surfacing, and leveling roads.

A suggestive outline for the study of agricultural or rural economics and rural sociology, C. P. CARY (*Madison, Wis.: State Supt. Pub. Schools, 1913, pp. 31*).—This outline was prepared especially for use in training teachers for country school work, rural economics being one of the subjects in which teachers must be examined in Wisconsin. Methods of teaching the following subjects are suggested: Agriculture as an occupation, the importance of agriculture, history of agriculture, development of the factory system, farming as a business, factors essential to producing the necessities of life, people's needs and wants, transportation, value, marketing of products and prices, agricultural problems, organization of the farm business, farm insurance, the farmer and the State, and country life.

Farm accounts, C. W. SMITH and S. M. THOMAS (*Philadelphia, Chicago, and Des Moines, 1913, pp. 82*).—The purpose of this book is to present simple methods of keeping accounts which the pupils of rural schools will be able to learn and also acquire the habit of using. Each exercise is followed by review questions. It is suggested that instead of being an extra study farm accounts may be substituted for some of the less important topics usually found in the ordinary text-books on arithmetic.

Agricultural supplement to Milne's progressive arithmetic—second book, E. C. BROOKS and I. O. SCHAUB (*New York, Cincinnati, and Chicago, [1914], pp. 305-320*).—In this agricultural supplement, compiled for the schools of North Carolina, the authors call special attention to the business side and value of good farming, the advantage of spraying orchards, the cost of keeping domestic animals, the use of fertilizer, land measurements, the cost and value of good schools and roads, and general farm statistics.

School district agricultural data, S. A. MINEAR (*Rural Educator, 3 (1914), No. 2, pp. 28, 29*).—Directions are given for preparing and using a chart representing an outline map of the school district, on which are shown outlines of the farms of the pupils' parents and data collected by the pupils concerning the acreage, yield, and value of the various farm crops, and the number and value of the live stock.

NOTES.

Arizona University and Station.—The 1914 farmers' short course attracted an attendance of 103. This was an increase of 33 over the previous year and was also deemed encouraging in that a much smaller proportion of students came from the immediate vicinity. A state farm improvement association was organized from among those present to cooperate with the station in studies of farm practice, the dissemination of improved seeds, the organization of local associations, boys' corn clubs, and similar bodies, and otherwise aid in improving farms and farm life.

The extension department has arranged a series of popular agricultural lectures in Phoenix under the auspices of the Y. M. C. A. and the Board of Trade.

It is expected that ground will be broken this spring for the new \$650,000 agricultural building and that this will be completed in 1915.

Arkansas University and Station.—The department of home economics has been transferred from the college of arts and sciences to the college of agriculture and plans laid to enlarge the service of this department.

Arrangements have also been made for the establishment of a plant for the manufacture of antihog cholera serum in connection with a packing plant in Little Rock.

Connecticut College.—A new laboratory course in greenhouse management is to be offered as a senior elective.

The college extension service has been devoting considerable attention to the organizing of the various counties. Murray D. Lincoln, a graduate of the Massachusetts College, has been appointed county agent for New London County beginning April 13. It is expected that an organization will be effected in Hartford County in the near future, while three other counties have the matter under consideration.

L. H. Schwartz has been appointed instructor in poultry beginning about July 1.

Georgia Station.—C. K. McClelland, agronomist of the Hawaii Federal Station, has been appointed agronomist beginning about June 22.

Purdue University.—The establishment of a course in farm management has been authorized by the board of trustees.

Iowa College and Station.—Arthur W. Griffin, formerly of the supervising architect's office of the U. S. Treasury Department, has been appointed assistant chief in agricultural engineering and will make a study of farm structures. Philip L. Blumenthal (Ph. D. Yale) has been appointed assistant chemist.

W. J. Kennedy has resigned as head of the extension work. Paul C. Taff of the extension division has been appointed acting director.

Kansas College and Station.—A 4-year course in highway engineering, optional in the civil and highway engineering course, and a 4-year course in agricultural engineering with three 4-year options in farm machinery, irrigation and drainage engineering, and flour milling, are to be offered.

The enrollment at the beginning of the spring semester was 3,014.

Louisiana Stations.—It has been decided to transfer the irrigation experiment with rice, which has been under way during the past four years, to the Bureau

of Plant Industry of this Department. There will now be provided for this work 30 or more plats properly leveed and equipped with irrigation and drainage canals. A drainage pump will be installed to be used for the double purpose of irrigating these plats and of providing drainage for the station farm. The land previously used for irrigation experiments will be devoted to a 4-year rotation of cotton, corn, soy beans, and cowpeas, and to the growing of miscellaneous crops.

An organization of farmers, known as the Southwest Louisiana Agricultural Society, was formed at a meeting called by the assistant director of the rice substation, March 7, and now has a membership of 43. This society is to meet at the substation monthly during the coming year. Some of the recent meetings have been devoted to a discussion of commercial fertilizers, a study of the data gathered by the station during the past four years, and a discussion of ways and means of charbon eradication.

Massachusetts College.—The 1914 summer schools will include the summer school of agriculture and country life, June 30 to July 28, the school for rural social service July 15 to 28, three boys' agricultural camps of about 10 days each in July, a poultry convention July 22 to 24, and the conference on rural community planning July 28 to August 1. The boys' camps will be conducted under military discipline, with instruction in agriculture, hygiene, citizenship, etc., each forenoon, and with the afternoons and evenings devoted to organized play and recreation, evening campfires, and the like. Each camp will be limited to 30 boys between the ages of 12 and 17, a charge of \$8 a week being made to defray the cost of maintaining the camp, board, instruction, and supervision.

The William R. Sessions fund of \$5,000 has been established by the college following a bequest from the former trustee of the institution.

Bert C. Georgia, instructor in market gardening, died May 24. He was a 1913 graduate of Cornell University and was 25 years of age.

Minnesota University.—W. H. Bender has accepted an appointment as associate professor of agricultural education to take effect the latter part of the summer.

Lincoln Institute, Missouri.—This institution, which is the state agricultural college of Missouri for negroes, has recently purchased a farm of 60 acres about a quarter of a mile from the main campus, for use in teaching agriculture and kindred subjects. Three men are to devote their time to the teaching of agriculture.

New Hampshire College.—Statistics recently collected indicate that of the 4-year students in agriculture during the last 19 years, 70 per cent have come from the farm. Of the graduates during this period, 51 per cent are now engaged in practical farming and 71 per cent of these are farming in New Hampshire. Twenty-five per cent are teachers of agriculture or allied subjects in secondary schools and 23 per cent are in the service of agricultural colleges and experiment stations or of the U. S. Department of Agriculture.

Of the graduates from the 2-year course in agriculture, 77 per cent are now engaged in practical farming. Of those who entered from New Hampshire, 84 per cent remain within the State.

Cornell University.—The fourth session of the School for Leadership in Country Life is announced for June 23 to July 3.

Dr. B. T. Galloway, Assistant Secretary of this Department, has accepted the position of director of the college of agriculture to take effect early in August. O. A. Johannsen and M. F. Barrus have been promoted to full professorships in the departments of entomology and extension work in plant pathology respectively.

North Dakota College.—A "little country theatre," seating about 200 persons, has been fitted up on the second floor of the administration building. It is proposed to utilize this in college work and also as an extension enterprise by disseminating information regarding plays or entertainments deemed adaptable for rural communities.

Ohio State University and Station.—Two types of scholarships have been established in the college of agriculture. In the first, three scholarships of three years each in the short course are assigned to each county, being awarded to the winners in the corn growing and other contests conducted by the state agricultural commission. In addition, the State is divided into four districts, each of which will receive five scholarships of four years each on the basis of a competitive examination on high school agriculture.

Announcement has been made by the agricultural commission that the extension activities of the State will continue to be conducted by the college of agriculture.

A bronze tablet in memory of the late Dr. H. A. Weber, professor of agricultural chemistry for many years, is to be placed in Townshend Hall.

A county experiment farm for Washington County is to be located by the agricultural commission at Fleming, where a tract of 170 acres, mostly hill land, has been selected. A tract of 10 acres, mainly terrace land, about 4 miles north of Marietta will also be used for work with truck crops.

M. C. Thomas and C. Ellis Bundy have been appointed county agricultural agents for Miami and Paulding counties respectively, L. E. Morgan assistant in nutrition, and Miss Mabel Corbould assistant chemist in milling and baking technology in the station.

Porto Rico University.—It is announced that the board of trustees has decided to reorganize the college course on a more elementary or preparatory basis, as most of the students who have entered the college have come direct from the eighth grade and have not been fitted to take up the collegiate work in the various branches of engineering and sciences leading to a degree. The trustees think it will be 10 years or more before there will be a student body available requiring the technical training usually offered by a college of agriculture and mechanic arts.

Virginia Station.—Director S. W. Fletcher has resigned to take effect July 1.

Virginia Truck Station.—Loren B. Smith, a recent graduate of Cornell University, has been appointed assistant state entomologist with headquarters at the Truck Station for the study of truck crop insects.

West Virginia University and Station.—Since the beginning of the year, 13 county agricultural agents, 9 district school superintendents in charge of boys' club organizations, and 9 women county agents in charge of girls' canning clubs have been appointed in cooperation with the farm demonstration work of this Department. During the past winter 24 one-day agricultural schools have been held in as many counties with 867 registrations and 642 visitors, and 11 four-day schools in home economics with 379 registrations and 278 visitors.

J. B. Huyett, president of the State Live Stock Association, has been appointed assistant in animal husbandry in cooperation with this Department and will make a live-stock survey of the State and carry on cooperative experiments in the feeding of beef cattle. F. S. Jacoby, associate professor of poultry husbandry in the Ohio State University, has been appointed temporary assistant for field work in poultry husbandry to study poultry methods, particularly marketing, in Jackson and neighboring counties during June, July, and August. Horace Atwood, the station poultryman, has been appointed agricultural agent for the Panhandle Agricultural Club in Ohio County, but will retain his connec-

tion with the station in supervision of some of the experimental work. Other appointments include R. R. Snapp (University of Illinois 1913) as assistant instructor in animal husbandry and assistant in animal husbandry in the station, effective July 1; H. L. Crane (West Virginia University 1914) as instructor in horticulture and assistant horticulturist, effective July 1; and Henry Dorsey (West Virginia University 1914) as instructor in agronomy and assistant agronomist.

Secondary Instruction in Agriculture.—An agricultural section of the Central Association of Science and Mathematics Teachers is to be established for high school teachers and others interested in secondary instruction in agriculture. A committee consisting of A. W. Nolan, K. L. Hatch, George D. Works, W. H. French, and I. A. Madden, has been appointed to prepare the program and take charge of the selection of officers for the first meeting of the section, to be held in Chicago on November 27 and 28. Among the questions to be discussed at this meeting are (1) the course of study in secondary agriculture, (2) extension work in secondary agriculture, (3) use of land in connection with school agriculture, (4) relation of the high school biological and physical sciences to agriculture, and (5) should emphasis be placed upon a two-year high school vocational course in agriculture, or upon a longer and more general course, or upon a course leading to college work?

Russian Agricultural Budget.—The 1914 budget contains an estimated expenditure for agricultural purposes of £16,638,600, an increase of £2,335,500 over 1913. The largest item is that of £5,300,000 for land organization and agricultural industries, which includes the maintenance of experimental and demonstration agencies, general measures for the development and improvement of various agricultural industries, including forestry, and assistance to peasants in districts under land organization. An allotment of £1,178,700 is estimated for drainage, irrigation, and peat cutting. The allotments for agricultural education and horse breeding are largely increased.

Promotion of Agriculture in Palestine.—The General Council for the Province of Palestine at its recent session appropriated \$1,826 to establish a breeding farm for horses and donkeys; \$13,200 for the establishment of an agricultural school and the transfer of the model farms from Artoof to Sajed and from Jaffa to Hebron; and \$2,640 for the purchase of agricultural implements.

New Journals.—A new publication, *The Annals of the Missouri Botanical Garden*, made its appearance in March. The publication is to be issued quarterly and will contain scientific contributions of members of the staff of the garden, from the Shaw School of Botany, and from visiting botanists working in the garden. It will take the place of the scientific papers formerly published in the annual report of the Missouri Botanical Garden, and the more popular portion of the report will be published in the Missouri Monthly Botanical Garden Bulletin. The annual report will be discontinued.

The American Journal of Botany has recently made its appearance. This new journal is edited by a joint committee of the Botanical Society of America, and is published by cooperative arrangement between the Botanical Society of America and the Brooklyn Botanical Garden.

Insecutor Inscitæ Menstruus is a monthly journal of entomology conducted by Harrison G. Dyar, Ph. D., and established in memory of Augustus Radcliffe Grote. It will deal especially with descriptions of species and genera, life histories, and similar material. The initial number is made up of notes on cotton moths by Dr. Dyar.

The division of agricultural education of the department of agriculture in the University of Minnesota has begun the monthly publication of *The Visitor*,

devoted to the interests of agriculture, manual training, and home economics in Minnesota high schools.

Allgäuer Monatschrift für Milchwirtschaft und Viehzucht is being published as the official organ of the dairy union of Allgau in Wurttemberg, with Dr. Kurt Teichert as editor. The initial number contains popular articles, reports of meetings, notes, reviews, etc.

Wiener Tierärztliche Monatschrift is being issued monthly in the interests of both practical and scientific veterinary medicine. It will contain original articles, abstracts, notes, etc.

The Illinois State Horticultural Society is publishing *Illinois Horticulture* as its official organ. Members of the staff of the Illinois University and Station are among the contributors.

Boletín de Bosques, Pesca, y Caza is the first publication of the kind to be issued in Chile. The subjects considered are treated chiefly in their industrial, commercial, and economic aspects.

The Banker and Farmer is being published monthly by the Agricultural Commission of the American Bankers' Association. The initial number deals especially with agricultural credit and farm demonstration work.

Buletino ufficiale della Associazione Orticola Professionale Italiana is a monthly of which Dr. Gustavo Vagliasendi is editor. It is devoted largely to official announcements and brief notes.

The National Field is being published as a weekly at Atlanta, Ga., as the official organ of the National Farmers' Union.

The Agricultural Journal, printed in Chinese, is being issued by the Chinese Department of Agriculture and Forestry.

Agricultural Schools in Panama.—Two agricultural schools are to be established in Panama. J. René Piot, agronomical engineer of Paris, has been selected as director of one of the schools, which will be located near New Gorgona. The government is also contemplating the establishment of an agricultural experiment station.

Miscellaneous.—*The London Times* announces that the trustees of the estate of the late H. B. Noble of Douglas, Isle of Man, have decided to devote \$100,000 to the fostering of agriculture on that island. It is expected that a board of agriculture will be established to administer the fund and additional moneys to be obtained from the island.

The London School of Tropical Medicine has sent an expedition to China to study the mode of dissemination of human diseases caused by trematode parasites, and the relation of such diseases to those occurring in domestic animals.

An additional department of animal pathology has been established in the Rockefeller Institute. Prof. Theobald Smith of Harvard University has been placed in charge of the new work.

F. W. Taylor, director of agriculture in the Philippine Islands, has resigned and will return to this country, and has been succeeded by H. T. Edwards, the former vice-director.

Dr. Otto May, honorary professor of agriculture at the Technical School of Munich, has died at the age of 81 years.

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EXPERIMENT STATION RECORD.

VOL. XXX.

ABSTRACT NUMBER.

No. 9.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

Introduction to biochemistry, W. LÖB (*Einführung in die Biochemie*, Leipzig, 1911, pp. 83, figs. 12).—This is a small book intended to serve as an introduction to biochemistry. It is a compilation of a series of lectures given in public high schools. The plant and animal kingdom are both considered.

The bearing of osmotic pressure on the development of physical or general chemistry, H. C. JONES (*Plant World*, 16 (1913), No. 3, pp. 73-88).—This topic is discussed for the purpose of showing its importance in relation to the biologic sciences.

The reduction of arsenic acid to arsenious acid by thiosulphuric acid, R. M. CHAPIN (*U. S. Dept. Agr., Jour. Agr. Research*, 1 (1914), No. 6, pp. 515-517).—"While endeavoring to work out a practicable field method for the estimation of the total arsenic—that is, a method which should include both arsenites and arsenates—in arsenical baths used for dipping cattle, studies were made upon the effect of various reducing agents which are able to absorb iodine in acid solution upon the well-known reversible reaction, $\text{As}(\text{OH})_3 + 2\text{I} + 2\text{H}_2\text{O} \rightleftharpoons \text{As}(\text{OH})_5 + 2\text{HI}$. Unless the solution in which this reaction is taking place is freely acidified with a strong mineral acid or heated, the progress of the reaction from right to left is inconveniently slow."

It was found, however, that sodium thiosulphate greatly aided the reduction, and further, that the presence of hydriodic acid played no part in the reduction of arsenic to arsenious acid. This reaction can be effected by sodium thiosulphate and mineral acid alone.

The present series of experiments was limited to a study of the reactions occurring when a mixture of arsenic acid, or arsenate, with an excess of sodium thiosulphate is acidified with a definite amount of hydrochloric or sulphuric acid, as this condition must prevail in any quantitative method for the determination of arsenic based on these reactions. The solutions employed were "(1) a tenth-normal (oxidimetric) solution of arsenic acid prepared by oxidizing arsenious acid with nitric acid and expelling excess of the latter, (2) a tenth-normal solution of sodium thiosulphate, (3) a twentieth-normal solution of iodine, free from iodate, and (4) normal hydrochloric acid."

From the experiments it is obvious that the action of thiosulphuric acid upon arsenic acid appears to be closely similar to the action of thiosulphuric acid on bichromic acid. A small amount of the thiosulphuric acid is decomposed into sulphur dioxide, and presumably, sulphur, but this does not become evident.

Most of the sulphur reacts with tetrathionic acid to form pentathionic acid and the remainder is in a colloidal solution. "The presence of pentathionic acid was here shown in a similar manner on several of the mixtures, while they still remained clear, by neutralizing with caustic alkali, using methyl orange as indicator. As the neutral point was reached, a distinct opalescence appeared which was not affected by hydrochloric acid, but which was dissolved after a time by excess of caustic alkali."

"For obvious reasons it is not likely that the reaction here noted, apparently for the first time, will afford the basis for a desirable volumetric method for use in the laboratory. It may be of value as a convenient means for reducing arsenic acid to arsenious acid preliminary to precipitation by hydrogen sulphid. As a basis for a field test, in default of anything better, it does offer some promise, and experiments in that direction are now under way."

On the formation of hydrocyanic acid from proteins, H. W. EMERSON, H. P. CADY, and E. H. S. BAILEY (*Jour. Biol. Chem.*, 15 (1913), No. 3, pp. 415-417).—Certain organisms, as for instance *Bacillus pyocyaneus*, will produce hydrocyanic acid when grown on egg. The yolk seems to be a more favorable medium for hydrocyanic acid production than the white.

For the first experiments in this work eggs contaminated with bacteria were broken, the whites separated from the yolk, and distributed into wide-mouthed 500 cc. flasks so that each flask contained either the whites or the yolks of 2 eggs. The flasks were loosely stoppered, put in a warm place, and tested each day by the Schönbein test for hydrocyanic acid. Seventy-four experiments were started in 9 different series, and in 8 experiments from 6 different series, after intervals varying from 4 days to 14 days, the egg substance evolved hydrocyanic acid. In a number of such cases crystals were obtained which looked like silver cyanid although the silver nitrate was darkened by the hydrogen sulphid, but the authors were not able to get positive results with the Prussian blue test. The yolks developed hydrocyanic acid in 6 cases and the whites in 2 cases.

Hydrocyanic acid was developed best when the organism was grown on a protein medium slightly acid to litmus and phenolphthalein. When hydrochloric acid is present to an extent where it may be detected by the usual methods, hydrocyanic acid is not produced.

Preliminary report on the production of hydrocyanic acid by bacteria, B. J. CLAWSON and C. C. YOUNG (*Jour. Biol. Chem.*, 15 (1913), No. 3, pp. 419-422).—A description of the biological features of one of the organisms isolated in the investigation described above. It is shown that the power "which the organism has of producing HCN is apparently not due to an extracellular enzyme. The organism was grown in gelatin for 72 hours at 37° C. and had been giving off HCN for 48 hours. After filtering through a Berkefeld filter, some of the filtrate was planted again into gelatin and incubated, but gave negative results for HCN. Hydrocyanic acid gas is apparently produced only under aerobic conditions, which led to the belief that the reaction in which HCN was produced was due to oxidation of the proteins. This was subsequently shown to be true. . . . Several other strains of *Bacillus pyocyaneus* were tested for HCN production, all of which returned positive results."

B. pyocyaneus was not the only organism capable of producing hydrocyanic acid, as an unnamed organism isolated from the soil and a culture of *B. violaceus* growing upon gelatin and egg produced it also. "There has been much work done on the production of HCN from grain, beans, linseed meal, germinating *Sorghum vulgare*, and other protein-containing substances. In most cases the production of HCN is attributed to an enzyme. Apparently all of the workers were using nonsterile material, which could have been easily contaminated by an HCN-producing organism."

About the formation of betain in animals and plants, ACKERMANN (*Abs. in Berlin. Klin. Wchnschr.*, 50 (1913), No. 26, p. 1235).—This is a study in regard to the method whereby betain is elaborated in the organism. Initial experiments were made with dogs and glycocoll but the results were negative. Sugar beets kept for six weeks in water cultures containing glycocoll showed no greater content of betain than beets grown in a medium free from glycocoll. On the other hand if β -pyridincarboxylic acid, i. e., nicotinic acid, is given to plants or animals, a synthesis seems to take place.

Crystallized polysaccharids from starch, H. PRINGSHEIM and A. LANGHANS (*Ber. Deut. Chem. Gesell.*, 45 (1912), No. 12, pp. 2533–2546; *abs. in Jour. Chem. Soc. [London]*, 102 (1912), No. 601, I, pp. 832, 833).—"The generic term 'amylose' is suggested for the polysaccharids of the formula $(C_6H_{10}O_5)_n$. Dextrin- β , which decomposes at 268° C., is too sparingly soluble in water for accurate cryoscopy, but dextrin- α (tetra-amylose), decomposing at 292° , proves to have a molecular weight $(C_6H_{10}O_5)_4$. Both forms are acetylated by acetic anhydrid in the presence of zinc chlorid, but scission of the molecules occurs at the same time; dextrin- α yields the hexa-acetate of a diamylose, needles, decomposing at 151.5 to 152.5° (correction $[a]_D^{24} + 100.6^\circ$ in acetic acid), while dextrin- β gives the mona-acetate of a triamylose, tablets, decomposing at 142° (correction $[a]_D^{24} + 112.6^\circ$ in acetic acid). Hydrolysis of these acetates by cold alcoholic potassium hydroxid produces respectively diamylose $(C_6H_{10}O_5)_2$ (decomposing at about 300° , $[a]_D^{24} + 136.2^\circ$ in water), which crystallizes from water in needles with $2H_2O$, and triamylose, $(C_6H_{10}O_5)_3$, needles, crystallizing with $4H_2O$, decomposing near 300° ; $[a]_D^{24} + 151.8^\circ$ in water. Crystallographic details of the above amyloses are given."

Crystallization of cream of tartar in the fruit of grapes, W. B. ALWOOD (*U. S. Dept. Agr., Jour. Agr. Research*, 1 (1914), No. 6, pp. 513, 514).—During a chemical examination made of the ripening fruit of grapes the analytical results were so affected as to lead to the belief that a deposition of the acid salt of bitartrate of potassium took place. An examination of the fruit grown at Charlottesville, Va., and Sandusky, Ohio, showed minute crystals, varying in size and shape, lying in the soft cells just beneath the skin of the fruit. They were not present at any time in the pulp or in the compact portion of the flesh in which the seeds are contained.

The fact that many of the crystals found did not conform in type to crystals of the bitartrate prepared from pure cream of tartar made it doubtful as to whether potassium bitartrate was deposited or not. Analyses of 1912 and 1913 grapes of the Concord, Catawba, Niagara, Delaware, and Norton varieties, however, showed that while the juice pressed from the hulls was very low in tartaric acid and salts, the organic matter remaining in the hulls after pressure, although less than half as acid as the pulp, is rich in tartaric acid and cream of tartar, in these regards nearly equaling the percentage found in the juicy pulp. The results made it obvious that the hulls, if pressed dry, would still retain the crystals mentioned and their presence was actually demonstrated with the microscope.

Further details of the investigation will be reported upon later.

The seeds and seed oil of bilberries and cranberries, A. DIEDRICHS (*Ztschr. Untersuch. Nahr. u. Genussmtl.*, 24 (1912), No. 9, pp. 575–580).—The weight of 1,000 cleaned seeds from the bilberry (*Vaccinium myrtillus*) is on the average 275 mg. The chemical composition of the seed calculated to dry substance was as follows: Protein 19.16 per cent, ether extract 33.25, crude fiber and nitrogen-free extract 45.81, and ash 1.78 per cent.

The oil extracted from the seeds was fluid at ordinary temperatures, was of a slight greenish-yellow color, and it had a pleasant taste. After standing

for a few days at room temperature, a sediment of stearin flakes was deposited. The constants of the oil were as follows: Specific gravity at 15° C., 0.9331; refraction at 40°, 71.2; at 25°, 79.8; iodine number 167.2; saponification number 190.4; Hehner number 95.72; degree of acidity 6.8; free oleic acid 1.92 per cent; Reichert-Meissl number 0.66; Polenske number 0.3; Baudouin reaction, negative; Halphen reaction, negative; and Bellier reaction, positive. The figures given by the fatty acids were for refraction at 40°, 57.3; iodine number 177.3; saponification number 200.7; and middle molecular weight 278. The hexabromide figure (Hehner and Mitchell) corresponded to that obtained for linseed oil, and linoleic acid was probably proven to be present in the oil.

The seeds of the mountain cranberry (*V. vitis idaea*) had the following chemical composition when calculated to dry substance: Protein 24.71 per cent, ether extract 32.03, crude fiber and nitrogen-free extract 41.01, and ash 2.25 per cent. The oil obtained from the seeds was light yellow in color and gave the following constants: Specific gravity at 15°, 0.9301; refraction at 25°, 75; at 40°, 83.4; iodine number 169.2; saponification number 190.1; Hehner number 95.7; acidity degree 3.45; free oleic acid 0.97 per cent; Reichert-Meissl number 0.55, Polenske number 0.3; Bellier reaction, positive; Baudouin reaction, negative; and Halphen reaction, negative. The fatty acids gave the following figures: Refraction at 40°, 60.4; iodine number 178.6; middle molecular weight 281; and saponification number 195.8. Linoleic acid was present. The weight of 1,000 seeds was 262 mg.

The hemagglutinating and precipitating properties of the bean, E. C. SCHNEIDER (*Jour. Biol. Chem.*, 11 (1912), No. 1, pp. 47-59; *abs. in Centbl. Bakt. [etc.]*, 1. Abt., Ref., 56 (1913), No. 3, pp. 66, 67).—The protein obtained from the Scarlet Runner bean contains a very active blood agglutinating agent. The protein of other beans contains less of this agglutinating substance. It is supposed to be a product of hydrolysis. The agglutinating substances were found to vanish gradually from the cotyledons and simultaneously with any nutrient material which might be stored up in the seed. Extracts made from the roots, stems, or leaves of the bean were found to have no agglutinating properties. If rabbit serum is added to the clear extract of the bean, a flocculent precipitate is obtained. The latter reaction does not always agree with the agglutinating properties and it seems to have some relation to the phaseolin of the bean.

The chemical composition of some fungi, E. WINTERSTEIN, C. REUTER, and R. KOROLEW (*Landw. Vers. Stat.*, 79-80 (1913), pp. 541-562).—In addition to the material on *Boletus edulis* fungi which has been noted previously (E. S. R., 28, p. 501), this article deals with autolyzing tests made with a paste of an edible mushroom (*Agaricus campestris*) containing when calculated on an air-dry basis 9.3 per cent of total nitrogen, of which 4.82 per cent is protein and chitin nitrogen, 0.73 per cent due to nitrogenous bases, and the remainder represents amino and other forms of nitrogen. A part of the fluid portion of the autolyzed mixture, shaken with kaolin and filtered through paper, contained, when calculated to dry substance, total nitrogen 11.06, protein nitrogen 0.67, nitrogen in the form of amino acids, etc. 8.16, basic nitrogen 1.63, and ammoniacal nitrogen 0.6 per cent.

The remaining portion of the autolyzate was extracted with chloroform, and from the chloroform extract a hydrochloride salt was prepared which physiologically resembled imidazoleethylamin. The substances yielded a precipitate with phosphomolybdic acid, potassium, bismuth iodide, phosphotungstic acid, and picric acid. The precipitate obtained with the latter substances finally became crystallized. A gold salt, corresponding to isoamylaminchloraurate ($C_5H_{11}NHAuCl_4$) was also obtained. Of the purine bases, guanine was probably present, and adenine, xanthine, and hypoxanthine were noted. So-called histidine,

arginin, and lysin fractions were also obtained. The arginin fraction seemed to contain several bases as well as trimethylhistidin. Arginin was prepared with much difficulty as a characteristic copper salt. From the lysin fraction cadaverin (pentamethyldiamin), putrescin, and probably lysin were obtained.

Some incomplete data on *Cantharellus cibarius* and *Craterellus cornucopioides* are reported. The quantitative results, however, show that with these 2 fungi an autolyzate can also be obtained which contains many nonprotein nitrogenous bodies.

On the basis of the results reported it is assumed that as a result of autolysis most of the proteins contained in fungi are split into simple crystalline cleavage products and also into higher complexes, peptones, and polypeptids. The authors intend to isolate various enzymes from the fungi described, and it is believed that the enzymes present in fungi produce from the protein substances materials from which some of the phanerogamic plants obtain their nourishment. Other products formed by the same agency are probably absorbed by the humin substances present in the soil.

About the behavior of fungi (*Aspergillus niger* and *Penicillium crustaceum*) toward phytin, M. A. JEGOROFF (*Hoppe-Seyler's Ztschr. Physiol. Chem.*, 82 (1912), No. 3-4, pp. 231-242).—*A. niger* and *P. crustaceum*, when grown in solutions of phytin previously sterilized, cleave the latter with the production of inorganic phosphoric acid. No cleavage was noted when the sterile phytin solution was incubated alone. It was not possible to determine whether the fungi assimilated the phosphoric acid directly or indirectly, except to say that the phytin is a good source of phosphorus for these fungi.

The best development of the fungi was on the peptone and saccharose solution, or on either saccharose or glycerin. Peptone alone gave relatively unsatisfactory results. When various phytin preparations were compared, no differences were noted with the exception of hemp phytin, which gave a low yield.

Citric acid formation from glycerin by fungi, C. WEHMER (*Chem. Ztg.*, 37 (1913), No. 4, pp. 37-39).—It was found, in addition to the fact that glycerin serves as a source of carbon for the citromyces, that it may also be changed into citric acid. Calcium citrate was prepared to quite an extent from a culture fluid which contained, besides glycerin and the fungus, ammonium nitrate, potassium phosphate, and magnesium sulphate. The inoculations were made with spores from the fungus obtained from 2 sources, (a) isolated from an oxalic acid solution, and (b) was found in a fluid containing 0.5 per cent of free sulphuric acid and used for the hydrolysis of cotton. No acidification of the medium (free acid) takes place during the process, even when no calcium carbonate is present. The same is true when either sucrose, lactose, mannit, xylose, or arabinose displace the glycerin in the culture medium. In the case of glycerin other substances are formed besides citric acid, some of which reduce Fehling's solution.

The phenomenon whereby a fungus growing in a certain medium will split off appreciable amounts of citric acid when calcium is added still needs to be explained.

In addition to the cultural substances mentioned above, beer wort (16° B.), peptone with and without mineral substances, and alcohol in 5 and 10 per cent concentrations were tested. The two first-named substances were satisfactory while alcohol was toxic, even in a concentration of 5 per cent.

Amygdalase and amygdalinase in *Aspergillus niger* (*Sterigmatocystis nigra*), and several similar hypomycetes, H. JAVILLIER and MME. H. TCHERNOBOUTSKY (*Bul. Sci. Pharmacol.*, 20 (1913), No. 3, pp. 132-140, fig. 1; *abs. in Chem. Abs.*, 7 (1913), No. 13, pp. 2228, 2229).—The optimum acidity of the media for these enzymes is either 0.001 normal to helianthin, or neutral, and the

optimum temperature is about 57.5° C. The amount of either enzyme present varies with the age of the mold but amygdalase always predominates. The greatest enzymatic activity was noted in 4-day-old cultures. The ratio of the two enzymes varied widely in other molds, one enzyme being present in excess at one time, the other at another time.

Studies on enzyme action.—VI, The specificity of lipase action, K. G. FALK (*Jour. Amer. Chem. Soc.*, 35 (1913), No. 5, pp. 616–624).—In this paper the action of methyl alcohol, ethyl alcohol, acetone, glycerol, and glucose on the activity of the lipase preparation was studied, and an explanation of the selective activity of lipases based upon the results obtained is given.

It is shown that "solutions of methyl alcohol, ethyl alcohol, and acetone exerted inhibiting actions on the hydrolysis of ethyl butyrate by a castor bean lipase preparation under comparable conditions, the amount of inhibition increasing with the concentration. Solutions of glucose and glycerol showed no inhibiting action except perhaps in the most concentrated solution. The view is suggested that simple esters exert an inhibiting action on lipase similar to that exerted by simple alcohols, and that higher esters (such as the glycerol esters) exert less inhibiting action similar to that exerted by glycerol.

"The lipolytic activity of the castor bean preparation was tested with solutions of methyl acetate, ethyl acetate, ethyl butyrate, and glyceryl triacetate (triacetin) of considerable ranges of concentration, and the results were correlated and explained by the aid of the theory outlined. Possible applications of the theory to the action of other hydrolyzing agents on esters compared with the action of lipase, to lipases of animal origin, and to the effect on the determination of the activity of lipase under various conditions of added substances, were mentioned. This theory, together with the specific actions of various groupings in the (presumably) protein molecule of lipase on the hydrolysis of esters as demonstrated [in the abstract below], will probably explain most, if not all, of the selective actions of the lipases. Finally, the use of triacetin as substrate for testing lipolytic activity is recommended."

Studies on enzyme action.—VII, A further study of the hydrolytic action of amino acids on esters, M. L. HAMLIN (*Jour. Amer. Chem. Soc.*, 35 (1913), No. 5, pp. 624–632).—"Glycin, glutamic acid, and aspartic acid exert a varying lipolytic action on methyl, ethyl, glyceryl tri- and phenylacetates, ethyl butyrate, and ethyl and phenyl benzoates. If these be arranged in the order of decreasing amounts of hydrolysis, the order will be different in the 3 cases where the action is caused by water, by glycin, and by glutamic or aspartic acids. This indicates selective action. The effect of sodium chlorid, sodium sulphate, and magnesium sulphate in solutions from 0.2 to 2 normal is not marked or consistent enough to be important for this work. The hydrolytic action of solutions of glycin and acetic acid on methyl acetate and ethyl butyrate is less than that of corresponding solutions of acetic acid alone; this difference is proportionately much less with ethyl butyrate."

Comparative study of the cleavage of saccharose by various acids in the presence of yeast invertase, G. BERTRAND and M. and MME. ROSENBLATT (*Ann. Inst. Pasteur*, 26 (1912), No. 5, pp. 321–331; *abs. in Zentbl. Expt. Med.*, 2 (1912), No. 15, pp. 684, 685).—The hydrolyzing power of various organic and inorganic acids in the presence of invertase, and possibly also of many other soluble enzymes, does not depend entirely upon the hydrogen ion concentration. It is also dependent upon the nature of the acids, i. e., the anions.

Some properties of koji-diastrase, G. KITA (*Jour. Indus. and Engin. Chem.*, 5 (1913), No. 3, pp. 220–222).—"Though koji may contain 2 different saccharifying enzymes, viz, amylase and glucase, the total quantity of the glucose in a saccharified solution could not be produced from maltose by the action of glucase

alone; hence koji must contain some other kind of diastase which produces glucose directly from starch without the aid of glucase. Common salt has a protecting action on koji-diastrase under heating but not on malt-diastrase, while Na_2HPO_4 , asparagin, and H_2SO_4 impair its activity more quickly. The inhibitory action of salt on koji-diastrase has a certain relation to the concentration of diastase. In a dilute enzymic solution it is very strong but not in a concentrated enzymic solution. It is therefore necessary in every case to note the concentration of diastase when we consider the influence of some salt upon it. The activity of koji-diastrase is conserved in brine for a long period."

The determination of nitrogen in organic substances, HERZFELD (*Pharm. Ztg.*, 57 (1912), No. 97, pp. 979, 980; *abs. in Chem. Ztg.*, 37 (1913), No. 14, *Repert.*, p. 58).—The organic material is treated with metallic potassium, taken up with water, ferrous sulphate added, heated gently, and filtered. A contact test is then made with a slightly acidified (HCl) ferric chlorid solution. At the juncture of the two fluids a blue coloration appears if nitrogen is present.

The colloid matter of clay and its measurement, H. E. ASHLEY (*U. S. Geol. Survey Bul.* 388 (1909), pp. 65, pl. 1, figs. 9).—In this paper clay is defined as a mixture of granular matter and a colloidal gel. The sources of the colloidal matters are organic and inorganic substances. The organic source resembles peat, while the inorganic is principally colloidal silicates and silicic acid, and less commonly alumina and ferric oxid.

Adsorption, which is the property that colloids have of taking up other substances out of a solution or suspension, may in most cases be represented by exact equations. The plasticity of a clay may be measured approximately by the adsorption of a dye. "The plasticity, taken as the product of the deformability by the force resisting deformation, reduces to the expression $\frac{C \times B}{A}$,

where C is the measure of colloids present, B is the cast air shrinkage, and A is the Jackson-Purdy surface factor.

"The dye test supplies a measure of the efficiency of grinding in increasing the plasticity of a fire clay. Questions that call for further study are the possible finding of a better dye than malachite green, the disturbing influence of minerals and salts in clays, and the formulation of a field test for plasticity."

About the determination of colloid substances in the soil, ROHLAND (*Landw. Jahrb.*, 42 (1912), No. 2, pp. 329, 330).—It is stated that the method described above, with some modifications, can eventually be employed for determining the colloids in the soil. The colloids as such in the soil regulate the passage of water and nutrient material to the plant and retain deleterious substances.

A contribution to the estimation of colloids in soils, I. M. GÓESKI (*Ztschr. Landw. Versuchsw. Österr.*, 15 (1912), No. 11, pp. 1201-1216, figs. 2).—It was found that crystal violet can be used as an adsorption dye for colloidal substances. It was strongly adsorbed by soils, and when brought into contact with soils does not alter its shade, which is considered an important advantage. The estimation of the dye was made colorimetrically by the König, Hasenbäumer, and Hassler methods. Some preliminary experiments conducted in regard to the behavior of crystal violet toward ferric and aluminum hydroxid showed that crystal violet was not adsorbed by either substance.

In a chemical study of van Bemmelen's method 3 different kinds of soils were used. The adsorption capacity of crystal violet was measured with the 3 soils, and proved Freundlich's equation correct. A comparison of the van Bemmelen and the staining methods seemed to show that a parallelism exists between them.

Soil carbonates.—A new method of determination, W. H. MACINTIRE and L. G. WILLIS (*Tennessee Sta. Bul. 100 (1913), pp. 83–97, figs. 2*).—The purpose of this investigation was to determine (1) the mineral acid least active upon soil organic matter in the estimation of carbonates in soils, (2) the concentration of the acid which would be best suited to all occurrences in light or heavily limed soils, and (3) whether the determination could be made with the ordinary laboratory equipment without the application of heat.

In other work the senior author has used phosphoric acid in lieu of hydrochloric acid for the estimation of soil carbonates. In the work now reported a comparative study was made of sulphuric, hydrochloric, and phosphoric acids, all being tested in three strengths for this purpose. The soil used was a fairly fertile loam of marked acidity with a carbon dioxid content of 0.0196 per cent.

Phosphoric acid was found the least active toward soil organic matter. Sulphuric acid was the most active in this respect.

Accordingly the activity of a 1:15 solution of phosphoric acid toward the organic matter contained in an original loam soil was compared with the action on the carbonaceous material in the same soil subsequent to treatment with a 1 per cent solution of hydrochloric acid and carbonated water to remove any carbonates which might be present. The data show that boiling with acid gives practically identical results on an acid soil both before and after elimination of carbonates. Boiling an untreated acid soil with carbon dioxid-free distilled water also showed an evolution of carbon dioxid. "This shows either action of heat upon the soil organic matter or reaction between minute localized occurrences of soil acids and carbonates."

The Marr method (E. S. R., 22, p. 511) was studied with boiling and at room temperature, except that instead of sulphuric acid phosphoric acid was used on a soil in which the carbonates were removed by cold digestion with 1 per cent hydrochloric acid. "The results show considerably less action on organic matter at 50° C. than that effected by boiling, but appreciably more than at room temperature. The same results were also found in the case of well-rotted barnyard manure and of barnyard soil. The addition of 48 tons per acre of manure was found to cause no increase in carbon dioxid evolution by treatment with one-fifteenth phosphoric acid in the cold." "Phosphoric acid 1:15 at room temperature liberates all of the carbon dioxid from calcium carbonate and magnesium carbonate in soils, and the carbon dioxid evolved can be collected by aspiration with suction, either gravimetrically or volumetrically."

"The following method . . . has given entire satisfaction, having been used upon 135 soil samples which were under absolute laboratory control and covering light and heavy occurrences of carbon dioxid. Where evolution of carbon dioxid is not greater than 0.2 gm., 50 gm. of soil may be used, the amount of soil for the charge being decreased with an increasing percentage of carbon dioxid. The evolution is kept to this amount in order that the soda-lime tubes may be effective for more determinations. A separatory funnel connected with purifying apparatus leads through a 2-holed rubber stopper to the bottom of a 300 cc. Erlenmeyer flask. Through the second hole is inserted a bulb tube leading to 2 purifying bottles containing concentrated sulphuric acid. To the second acid bottle is attached a U tube containing soda lime and this is attached to a tube containing pumice stone saturated with concentrated sulphuric acid. . . . If volumetric determinations be desired, a Folin absorption tube or a tower containing glass beads may be used. After purifying the atmosphere of the apparatus, 60 to 100 cc. of phosphoric acid 1:15, carbon dioxid-free, is added through the funnel and the carbon dioxid drawn off at a very slow rate, with constant agitation, for 10 minutes. The second 10 minutes the rate is slightly increased, and during the third 10-minute period purified air is drawn

fairly rapidly through the system. Slight vacuum should be maintained. The essentials of the method are very slow aspiration at first, constant agitation, and slight vacuum."

If finely ground, limestone and dolomite can be examined for carbonic acid by the method with or without soil, under the above conditions. Dilute phosphoric acid in the cold is not appreciably active upon ferrous carbonate and but slightly so on manganese carbonate.

"In comparative carbon dioxid studies, a blank should be run upon the soil subsequent to its being freed of carbonates, and a correction made for the action of the acid on organic matter."

A bibliography is appended.

Examination of artificial fertilizers (*Ztschr. Landw. Versuchsw. Österr.*, 15 (1912), No. 7, pp. 850-886).—The methods included deal with the collection and preparation of samples; examination of fertilizers containing (a) phosphoric acid, (b) potassium, (c) nitrogen, and (d) lime; general methods for moisture; fine powder in Thomas slag powder; perchlorate in saltpeter; sulphocyanid in ammonium sulphate; lime and magnesia; sulphuric acid; iron and aluminum oxids; calcium sulphate; carbon dioxid; and the chloroform extract of bone meal. In addition to limits of error and the methods of reporting results are discussed.

In the appendix the preparation of the reagents is described, and a table is given for calculating phosphoric acid (P_2O_5) from magnesium pyrophosphate and potassium from potassium perchlorate.

Application of the microscope to the analysis of fertilizers, E. COLLIN (*Ann. Falsif.*, 6 (1913), No. 51, pp. 14-24, figs. 9).—This deals with the histologic features of the various organic substances which go to make up fertilizers. Especially considered are dried blood, powdered meat, insect debris, horny material, tannery waste (hides), waste hair, silk, wool, feathers, peat, and charcoal.

In regard to the determination of water-soluble phosphoric acid in superphosphates, F. PILZ (*Ztschr. Landw. Versuchsw. Österr.*, 15 (1912), No. 11, pp. 1238-1244).—The method originally adopted by the Austrian Association of Agricultural Experiment Stations consists of placing 20 gm. of superphosphate (or 10 gm. of double superphosphate) in a Stohmann liter flask with about 800 cc. of distilled water and shaking in a rotary apparatus (30 or 40 revolutions per minute) for one-half hour at room temperature. The mixture is then made up to the mark, shaken thoroughly, and filtered through a dry folded filter into a dry glass. By filling up the flask before rotation higher results are obtained, and this change has been adopted by the association.

Soluble silicic acid in Thomas slag powder and its influence upon the determination of citric acid-soluble phosphoric acid, M. POPP ET AL. (*Landw. Vers. Stat.*, 79-80 (1913), pp. 220-278).—A detailed account of material previously reported from other sources (*E. S. R.*, 29, p. 410).

The determination of citric acid-soluble phosphoric acid in Thomas slag powder, W. SIMMERMACHER (*Chem. Ztg.*, 37 (1913), No. 15, pp. 145, 146; *abs. in Chem. Abs.*, 7 (1913), No. 13, p. 2278).—A review of methods and a discussion of Popp's method (see above).

The detection of alum in bread, J. R. N. VAN KREGTEN (*Chem. Weekbl.*, 10 (1913), No. 3, pp. 58-60; *abs. in Chem. Abs.*, 7 (1913), No. 13, p. 2262).—In addition to examining the ash, 2 reactions must be used. One of these is with tincture of hematoxylin (logwood); the other, which utilizes alizarin, must be modified for use with bread. Both reactions are given in the *Codex Alimentarius*.

Detection and estimation of the xanthin bases in cocoa, tea, coffee, and their derivatives, S. CAMILLA and C. PERTUSI (*Abs. in Jour. Chem. Soc. [London]*, 102 (1912), No. 601, II, p. 1111; *Jour. Soc. Chem. Indus.*, 31 (1912), No. 22, pp. 1002).—Small amounts of xanthin bases can be detected with potassium permanganate and potassium hydroxid in an aqueous solution wherein they form carbylamins. For estimating the xanthin bases, the following procedure is recommended:

Ten gm. of chocolate or cocoa is boiled for one-half hour with 150 cc. of water and 50 cc. of normal sulphuric acid solution, made up to 500 cc. with water, and then filtered hot. One-half of the filtrate is neutralized with magnesium oxid, concentrate to about 80 cc. on the water bath, acidify with dilute sulphuric acid, and extract with carbon tetrachlorid for from 2 to 3 hours. The extract, which contains the caffein, small amounts of theobromin, and fat, is after adding a little piece of paraffin, evaporated to dryness and the residue extracted with boiling water acidified with sulphuric acid. The solution is filtered and added to the remaining half of the original extract, and the whole evaporated to dryness with 5 gm. of magnesium oxid. The residue is extracted with boiling chloroform 4 or 5 times, using 100 cc. of solvent each time. The chloroform solution is then evaporated.

Tea and coffee products can be dealt with by a similar process.

The Babcock test with special reference to testing cream, H. E. Ross and T. J. MCINERNEY (*New York Cornell Sta. Bul.* 337 (1913), pp. 27-47, figs. 12).—This gives specific directions for performing the Babcock test for fat in milk, cream, skim milk, butter, cheese, sour milk, and churned milk, with some results of experiments.

In those which were made for the purpose of determining the effect of temperature on the fat column of a whole-milk bottle it was shown that "the fat column in a whole-milk bottle is not large enough to be greatly affected by temperature unless it is extremely hot or cold."

In testing skim milk it is necessary to use a special bottle, extra acid, and to whirl for a longer period of time in order to get proper results. Frozen milk should be melted, but in melting the ice no temperature above 85° F. should be used. Milk allowed to stand a time before freezing will show a high content of fat in the ice, while a milk agitated while freezing will show a greater quantity of fat in the liquid part.

For testing cream better results may be obtained by weighing the sample than by measuring it. In the experiments a difference of 0.5 to 4.5 per cent was noted between the two. It is advisable to immerse the cream bottle with its contents, after treatment with acid, in a water bath at 150° and in such a manner that the fat column is below the surface of the water. The length of time necessary for the fat column to reach the temperature of the bath varied in the experiments from 2 to 4 minutes. The use of about 0.5 cc. of glymol (white mineral oil) colored with alkanet is recommended in order to facilitate the reading of the fat column. This removes the meniscus and makes a sharper line of demarcation between the fat column and the added substance.

When the chemical method (ether extraction) is compared with the Babcock method and the meniscus is removed with glymol, "the Babcock method will compare very favorably for all practical purposes with the chemical method when read at a temperature between 140 and 150°. Sixty-four experiments were performed, both Babcock and chemical, and of that number there were 35 that compared within 0.2 per cent. The cream bottles are graduated only as fine as 0.5 per cent; therefore it may be concluded that in this number of experiments there were only 8 that varied more than 0.5 per cent."

The kinetics of the inversion of sucrose by invertase, C. S. HUDSON (*Abs. in Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York], 25 (1912), Sects. I-Ve, App., p. 375*).—"Measurements by the polariscopic method at 30° of the rate at which the enzym invertase, prepared from bottom yeast, hydrolyzes pure sucrose in aqueous solution under the conditions of slight acidity which cause the maximum enzymotic activity, show that the reaction deviates from the unimolecular order to a large extent in 14 per cent sugar solutions, but approaches agreement with this order as the dilution increases. As the concentration of sucrose increases about 14 per cent, the reaction again approaches this order, and in 50 and 60 per cent solutions the order is followed within the limits of experimental error."

Inversion of cane sugar solutions with ammonium chlorid, F. STROHMER and O. FALLADA (*Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York], 8 (1912), Sect. Va., pp. 85-92*).—A study was made for the purpose of determining the conditions under which cane sugar is hydrolyzed through the agency of ammonium chlorid. The amount of inversion was found to be dependent upon the amount of ammonium chlorid used, the temperature, and the time in which these were allowed to act. Owing to the variable results obtained for the sucrose, the authors do not believe that the method in its present condition can be used for analytical purposes.

Attempts were made with catalyzers, zinc dust, and platinum sponge for the purpose of accelerating the reaction, but with unsatisfactory results. Adding a small amount of acid did not seem to help matters. The greatest degree of inversion was obtained when 50 cc. of sugar solution containing 13.024 gm. of saccharose, with 30 cc. of saturated ammonium chlorid solution, were brought to the boiling point. The solution, however, was yellow, which points to a decomposition of invert sugar. When catalyzers were used, the maximum inversion was not immediately obtained and progressed long after the solution was made up to the mark at 20° C.

A peculiar increasing inversion was also noted after half-normal sugar solution was heated at 110° for three-quarters of an hour with 30 cc. of a slightly acidified saturated solution of ammonium chlorid. The inversion was complete 24 hours after filling to the mark at 20°, but the results were higher than those coming from hydrolyzed saccharose. Heating for a whole hour at the same temperature will produce about the same results within 2 hours after filling to the mark.

The results of neutralizing the acid were also studied.

Corrected inversion method according to Clerget, E. SAILLARD (*Jour. Fabric. Sucr., 54 (1913), No. 4; abs. in Chem. Ztg., 37 (1913), No. 14, Repert., p. 66*).—The method consists of dissolving 52 gm. of molasses in a 200 cc. flask, clarifying with from 10 to 20 cc. of lead acetate solution, filling to the mark with water, and filtering. The excess of lead is removed from 100 cc. of the filtrate with sulphurous or oxalic acid, neutralization effected with calcium carbonate or barium carbonate, some pure animal charcoal added, and filtered. To 50 cc. of this filtrate is added 50 cc. of a 6.85 per cent solution of sodium chlorid and the polarization determined. To another 50 cc. of the filtrate are added 25 cc. of water and 5 cc. of hydrochloric acid of 22° B. (2.15 gm. of hydrochloric acid in 100 cc.). This is inverted in the usual manner, neutralized with 20 cc. of a solution of pure sodium carbonate containing the equivalent of 5 cc. of hydrochloric acid, filtered, and the (inversion) polarization determined. If the inversion is complete, the method gives accurate results.

Decomposition of glutamates on heating in aqueous solution, and a new optically active nonsugar [and its influence in the double polarization

method of determining sucrose], V. STANĚK (*Ztschr. Zuckerindus. Böhmen*, 37 (1912), No. 1, pp. 1-17; *abs. in Jour. Soc. Chem. Indus.*, 31 (1912), No. 20, p. 1001).—In the experiments solutions of potassium glutamate were heated in sealed tubes for periods varying from one-half to 24 hours and to temperatures from 90 to 250° C., when the rotation in the presence of basic lead acetate and hydrochloric acid was determined. Heating at a low temperature and for a comparatively short time almost destroyed the optical activity.

"On studying the products of decomposition thus obtained, it was found that levorotatory glutimic acid, $C_5H_7NO_3$, is formed at the lower temperatures, such in fact as are used in practice, but that above 200° the optically inactive isomerid of the same acid is almost exclusively proved. In presence of hydrochloric acid, even in the cold, it was noticed that the optically active isomerid gradually loses its levorotation and becomes dextrorotatory, finally, in fact, becoming hydrolyzed to glutamic acid hydrochlorid, $C_5H_9NO_4HCl$. This observation has an important bearing on the determination of sucrose by the double polarization method in beet products, and it is computed by the author that if only 3 per cent of the levorotatory glutimic acid be present in beet molasses, the error will be 0.9 per cent when the ordinary basic lead acetate direct reading is followed; but only about 0.05 per cent if the acid direct polarization, using hydrochloric acid and urea, be employed."

A revision of the hundred point of the saccharimeter, F. J. BATES and R. F. JACKSON (*Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York]*, 25 (1912), Sects. I-Ve, p. 517).—"For the purpose of checking the accuracy of saccharimetric analysis, the polarization of highly purified sugar solutions was measured. For the preparation of pure sucrose the method of crystallization from aqueous solutions after concentration in a vacuum boiling apparatus was developed. The sugar thus prepared did not differ essentially from that precipitated by alcohol. A study of the purified sugar showed the absence of ash and a negligible quantity of reducing substances.

"The experiments on reducing sugars showed the effect of sucrose on alkaline copper solutions and in the calculations this effect was taken into consideration. The velocities of caramelization of sugar at various temperatures were measured and a curve platted indicating the length of time needed at each temperature to produce a quantity of caramel equivalent in reducing power to 0.01 per cent invert sugar. The data are for 79.5°, 1.8 hours; 66.6°, 10.9 hours; 50°, 107 hours; 39°, 478 hours.

"The results prove that caramelization occurs at comparatively low temperatures, the effect taking place spontaneously, if slowly, at laboratory temperatures. The allowable time of heating as determined by the caramelization curve was applied to moisture elimination. A combination of high temperature and high vacuum was relied upon to dry the sample. Solutions for polarization were prepared, both gravimetrically, by reference to density tables, and volumetrically. The specific rotation of the normal solution was measured on a precision polarimeter for wave length 546.1 and found to be 78.385° at 20° C. By the use of a quartz plate, which had been certified by the Physikalisch-Technische Reichsanstalt and the Bureau of Standards, the scale correction of a saccharimeter was found and the correction applied to the polarization of the normal sugar solutions. These latter read not 100° but 99.91. The Herzfeld-Schonrock standard was concluded to be in error. If so, the new conversion factor for $\lambda=589.25$ was computed to be 34.626, and that for $\lambda=546.1$ was 40.707."

About the determination of raffinose in the sugar beet, L. NOWAKOWSKI and J. MUSZYŃSKI (*Abs. in Centbl. Zuckerindus.*, 21 (1913), No. 48, p. 1748).—The methods used for determining raffinose at the present time depend upon

making a direct polarization and a polarization after inversion, and the results obtained are calculated by Herzfeld's method. The chemical method in which the raffinose is converted into mucic acid by oxidation with nitric acid does not give satisfactory results.

The purpose of this work was to elicit which of the methods used at the present time for determining sucrose in beets, i. e., alcoholic digestion and hot aqueous digestion, is the most satisfactory for estimating the amount of raffinose, and in what way lead subacetate affects its estimation. The hot aqueous digestion method was the method finally recommended. Where no lead subacetate or an insufficient amount was used some raffinose was detected, but when as much as 10 cc. of subacetate of lead solution to the normal weight was employed no raffinose was found. In some experiments in which raffinose was added, almost the same amount was noted in the final calculation. The conclusion is reached that there need be no fear of forming lead raffinates in the hot aqueous digestion method.

Examination of commercial starch (*Ztschr. Landw. Versuchsw. Österr.*, 15 (1912), No. 11, pp. 1217-1220).—The methods described are those adopted by the Austrian Association of Agricultural Experiment Stations, and are for the purpose of supplying means for the uniform judgment of starches, especially potato starch, according to the standard set up by the Vienna Stock Exchange. The methods include those for color, spreading power, detection of chlorin and inorganic acids, determination of water (indirect determination of the starch), determination of ash, inorganic loading materials, acidity, and the direct determination of starch.

Examination and judgment of vegetable tanning substances (*Ztschr. Landw. Versuchsw. Österr.*, 15 (1912), No. 9, pp. 1122-1146).—A discussion of methods and criterions for the valuation of vegetable tanning materials as adopted by the Austrian Association of Agricultural Experiment Stations. The determinations to be made on tannin barks are tannins, nontannins, and possibly moisture; in extracts, tannins, nontannins, insoluble substances, moisture, and possibly ash. The last constituent will give a clew as to whether the extract has been sulphited.

Determination of fat in feeds, with particular reference to shaking out with trichlorethylene in the cold, R. NEUMANN (*Landw. Vers. Stat.*, 79-80 (1913), pp. 701-736, fig. 1).—The results obtained from various feeds showed that trichlorethylene was satisfactory for estimating the fat, etc., in this class of material. It was only necessary to extract in the cold. When the material under examination contains much protein, e. g., meat, fish meal, or much fat, e. g., ajowan residues or millet polish meal, it must first be treated according to von Hissink's method. Sesame cake, when extracted for a long time with ether, yields nonfatty substances which are deposited in the extraction flask, but by shaking this material with trichlorethylene in the cold, these substances are not extracted.

Homemade cider vinegar, W. G. SACKETT (*Colorado Sta. Bul.* 192 (1913), pp. 3-15).—In this bulletin the use of waste apples is urged for the preparation of cider vinegar. The various steps in the process are described and emphasis is laid especially on the use of pure cultures of yeast and bacteria for this purpose. The cultures are supplied at a nominal cost by the station.

Pineapple vinegar, W. P. KELLEY (*Hawaii Sta. Rpt.* 1913, p. 34).—In the canning of pineapples there results an enormous waste of juice which amounts to hundreds of thousands of gallons per annum. Some of the juice is utilized for making sirup and, to a limited extent, for preparing bottled pineapple juice.

Attempts to convert the juice into vinegar with the rapid vinegar process were made but the results were not entirely satisfactory. "On an average the

vinegar obtained contained an acetic acid content of about 3.8 per cent, which is considerably below the legal standard. Occasionally it was possible to obtain vinegar of approximately 4.5 per cent." Difficulty was experienced in obtaining a good degree of alcoholic fermentation of the juice, as various other types of fermentation took place simultaneously with it.

The price obtained for the finished product did not warrant further investigation of this problem but it may be continued at some future date.

Utilization of waste oranges, W. V. CRUESS (*California Sta. Bul.* 244 (1914), pp. 157-170, figs. 2).—In addition to the material previously noted (E. S. R., 30, p. 316), this bulletin describes the preparation of orange vinegar and orange wine from waste oranges, and reports analyses thereof.

In preparing orange vinegar it is recommended that the juice before fermentation be treated with potassium metabisulphite. After standing for 24 hours the clear juice is drawn off and fermented with pure cultures of yeast. The finished juice is stored in well-filled, closed barrels or tanks until required for converting into vinegar.

"Strong vinegar equal in amount to about one-fourth the volume of the fermented juice should be added to the orange wine to prevent the growth of wine flowers and promote the development of the vinegar fermentation. The vinegar fermentation must take place in containers that allow a good surface of the vinegar to be exposed to the air. The vinegar may be cleared by filtering."

"Orange wine may be made by defecating the fresh juice after the addition of moderate amounts of potassium metabisulphite to prevent fermentation for a short time, fermenting the clear juice with pure yeast, and filtering the finished wine to clear it. This cleared wine may be turned into sparkling orange wine by the addition of a small amount of sugar and by subsequent fermentation in bottles."

METEOROLOGY—WATER.

The weather element in American climates, R. DEC. WARD (*Abs. in Science, n. ser.*, 39 (1914), No. 1003, p. 429).—An abstract of a paper read at the tenth annual meeting of the Association of American Geographers at Princeton, N. J. Since American climates are chiefly made of cyclonic weather and the distribution of meteorological elements in a cyclone is different in different parts of the country the author has undertaken to prepare regional cyclonic weather types for the United States.

The frostless period in Maryland and Delaware, O. L. FASSIG (*Abs. in Science, n. ser.*, 39 (1914), No. 1003, p. 429).—This is an abstract of a paper read at the tenth annual meeting of the Association of American Geographers at Princeton, N. J., in which it is shown that "the number of days (average of 20 years) between the last severe frost or freezing temperature in the spring and the first in the fall ranges from 130 days in the west to over 200 days in the immediate vicinity of Chesapeake Bay. For further study of plant growth as related to climatic conditions, phenological observations of similar plants in the same soil (transported) are to be undertaken at many points, each group being visited every 10 or 15 days."

Soil moisture and agricultural meteorology, J. B. GÈZE (*Jour. Agr. Prat.*, n. ser., 27 (1914), No. 9, pp. 272-274).—It is maintained in this article that it is very important from the standpoint of agricultural meteorology to note regularly the moisture conditions of the soil, and certain simple observations having this object in view are described, such as the appearance with reference to moisture of the surface soil, the flow of drains or shallow springs,

the flow of streams, and the color of the water. These observations to be of interest to agriculture must be accompanied by a precise knowledge of the physical character of the soil studied.

Is the earth drying up? J. W. GREGORY (*Geogr. Jour.*, 43 (1914), Nos. 2, pp. 148-172, figs. 3; 3, pp. 293-318).—The evidence bearing on this subject is summarized in this article from a great variety of sources and for various parts of the world.

The general conclusion is that "there have been many widespread climatic changes in late geologic times, while in historic times there has been no world-wide change of climate."

An extensive bibliography of the subject is appended.

Is South Africa drying up? R. VON GERNET (*Agr. Jour. Union So. Africa*, 7 (1914), No. 1, pp. 47-50).—The author maintains that South Africa has been undergoing a process of desiccation, not only for the last 30 or 40 years but for thousands of years. He states "that the water courses carry less water than of old, springs and spruits give out even before the water has been taken out for irrigation, soft rains of long duration are rare, instead of which we are getting torrential and short downpours doing a lot of harm by erosions while the water is running to waste."

This condition is attributed to slow geologic processes resulting in the uplift of the land and the more recent influences of deforestation. The construction of a system of dams and reservoirs to store flood waters is urged as a remedy for the unfavorable conditions.

Secular variation of precipitation in the United States, A. J. HENRY (*Bul. Amer. Geogr. Soc.*, 46 (1914), No. 3, pp. 192-201, figs. 3).—The available precipitation data for the past 40 or 50 years are summarized in tables and diagrams and are discussed with reference to the country as a whole and to various districts. The author concludes that the data lend "no color to the theory of a cycle in precipitation . . . but in practically every case confirm the conclusion that the occurrence of wet and dry years seems to be wholly fortuitous so far as the United States are concerned."

The observations are thought to show that the probability that heavy rains will occur in all parts of the country in one and the same year is very small. "On the other hand, diminished precipitation over great areas seems to occur with much greater frequency than increased precipitation. The tendency in nature, as shown by the summary of the last quarter of a century, seems to be toward years of lean rainfall, while years of fat rainfall seem to be due to an extraordinary deflection or disturbance in one or more of the dominant members of the atmospheric circulation." The figures make it clear in general that precipitation varies not only from year to year but also as between the different parts of the country.

The snowfall about the Great Lakes, C. F. BROOKS (*Abs. in Science*, n. ser., 39 (1914), No. 1003, pp. 429, 430).—This is an abstract of a paper read at the tenth annual meeting of the Association of American Geographers at Princeton, N. J. It is explained that "the snowfall in this region is heavy because of much moisture precipitated at low temperature by the many winter cyclones. On account of the cooling action of land on the prevailing west winds blowing across the lakes, the east shores get more snow than the west. Ice on the lakes, by diminishing evaporation, reduces the snowfall of the leeward shores. Thus the heaviest snowfall comes early in winter on the east shores, in marked contrast with the late winter maximum on the west shores."

Nitrogen and chlorin in rain and snow, G. H. WIESNER (*Chem. News*, 109 (1914), No. 2830, pp. 85-87).—The nitrogen and chlorin content of 22 samples of rain and 9 of snow collected at Mount Vernon, Iowa, from February 22 to

June 5, 1912, is reported. The average of free ammonia in snow was 3.35 parts per million, in rain 0.931 part per million; alluminoid ammonia in snow 3.84 parts, in rain 1.13 parts; nitrite nitrogen in snow 0.0021 part, in rain 0.0018 part; nitrate nitrogen in snow 0.19 part, in rain 0.15 part. The average of the chlorin in the rain and snow was about 4.8 parts per million. It is estimated that the total amount of nitrogen carried down to the soil in rain and snow during the period named was 6.27 lbs. per acre.

The sterilization of water by ultraviolet rays, A. SILBERMANN (*Ztschr. Hyg. u. Infektionskrank.*, 77 (1914), No. 2, pp. 189–216, fig. 1).—The general conclusion reached from the investigations here reported is that sterilization of drinking water by means of the quartz mercury vapor lamp is entirely practicable provided precautions are taken to insure the proper working of the apparatus. These precautions are set forth in some detail.

A bibliography of references to the literature of the subject is given.

Metropolitan sewage farm, A. M. LAUGHTON (*Victorian Yearbook*, 33 (1912–13), pp. 260–264).—This is a brief account of the farm used in purification of the sewage of Melbourne, with data regarding its operation and efficiency.

The total area of this farm is 9,153 acres. The land is prepared for sewage disposal by division into paddocks of 20 acres each, seeded to alfalfa or perennial grasses (mainly prairie or rye grasses). “With the exception of a few hundred acres of lucern reserved for hay, the land is grazed with sheep, cattle, and horses, the practice being to keep the stock shifting from block to block to eat the feed down in front of the sewage water.” The principal business is “the fattening of store sheep, but the grazing and farming operations are subservient to the main object of the farm, viz, the filtration of the equivalent of about 7.1 ft. of sewage per acre per annum.”

The area actually under irrigation in 1911–12 was 4,932 acres; the area available for sewage disposal was 5,894 acres. The average daily quantity of sewage delivered to the farm was 31,066,653 gal. The revenue from grazing amounted to £15,245 (\$76,225). The net cost of sewage purification during the year was £8,736 (\$43,680) or 3.7 d. (7.5 cts.) per capita of population.

SOILS—FERTILIZERS.

Estimation of the surface of soils, J. A. HANLEY (*Jour. Agr. Sci. [England]*, 6 (1914), No. 1, pp. 58–62, fig. 1; *abs. in Jour. Soc. Chem. Indus.*, 33 (1914), No. 4, p. 210).—Several methods of estimating the surface area of soils are noted and tests of the dye method described by Ashley (see p. 807) and by König, Hasenbäumer, and Hassler (*E. S. R.*, 26, p. 519) are reported.

Comparisons of the quantities of dye removed by sandy loam, loam, and clay loam soils from methyl violet dye solutions of 12 different strengths varying from 0.25 gm. to 3 gm. per liter showed that in all cases the dye absorbed increased rapidly with an increasing strength of dye solution up to a certain point when the soil appeared to become almost saturated, indicating “that if dye solution of one strength be used the three figures obtained can not be comparable. . . . To obtain relative values indicating the active surfaces of different soils it is necessary that each soil be brought into equilibrium with a solution of the same strength. . . . It is necessary to use . . . not the same strength of dye solution throughout but such a strength for each soil as will leave it when dyed in equilibrium with the same dye solution. . . . [Also] the relative values for different soils ought to be the same whatever the concentration of the final solution.” Curves indicating the quantities of dye absorbed by the same soils “when in equilibrium with solutions of strengths varying by 0.0125 gm. per 100 cc. from 0.0125 to 0.125 gm. per 100 cc. . . . [show] that the values on the

lower parts of the curve where the dye solutions are weak vary considerably, but from 0.0375 per cent to 0.1125 per cent they are constant. . . . In actual experimental work, then, the equilibrium solution chosen should be one between 0.0375 and 0.1125 per cent; the most convenient is 0.05 per cent."

Study of the physical analysis of the fine particles of clay, A. MÜNTZ and H. GAUDECHON (*Ann. Inst. Nat. Agron., 2. ser., 12 (1913), No. 2, pp. 233-271, figs. 5*).—This is a more detailed account of investigations briefly reported elsewhere (*E. S. R., 30, p. 422*).

Soil investigations, J. W. AMES and E. W. GAITHER (*Ohio Sta. Bul. 261 (1913), pp. 449-512*).—Investigations on the composition of 126 calcareous and noncalcareous soils of Ohio are reported, special attention being directed to the phosphorus content as regards deficiency, availability, and combination.

The gradual loss of calcium carbonate from cultivated soil was illustrated by soils, originally of limestone formation but containing no calcium carbonate, in which the total calcium and magnesium and that soluble in fifth-normal nitric acid was greater than in soils overlying sandstone and shales. An acid soil receiving 12,000 lbs. of ground limestone in 1907 contained only 2,100 lbs. of calcium carbonate at the end of a 5-year rotation in 1912.

Sands, silts, and clays examined exhibited no marked differences in chemical composition, although the clays and clay loams generally contained less total silica and slightly more iron, alumina, and potassium. Calcareous soils contained less silica and more phosphorus and potassium than noncalcareous soils. Black clay loams of limestone origin contained more phosphorus and nitrogen than other soils analyzed. In most cases they contained calcium carbonate. The surface soil to a depth of 6 in. contained more phosphorus than the subsoils (6 to 36 in.) except in a few cases where the latter contained considerable calcium carbonate, and also more nitrogen and organic matter and fine particles. The total silica was generally largest in the surface soil while the silica soluble in fifth-normal nitric acid was usually greater in the subsoil. The total iron, alumina, and potassium were greater in the subsoil than in the surface soil. Soils containing no calcium carbonate contained more calcium and less magnesium in the surface than in the subsoil. Soils containing calcium carbonate contained more of both calcium and magnesium in the subsoil than in the surface soil, the calcium being in excess of the magnesium. Noncalcareous soils always contained more magnesium than calcium in the subsoil and generally more in the soil as a whole. All the soils examined contained more calcium than magnesium soluble in fifth-normal nitric acid.

The litmus paper test proved satisfactory as a qualitative test for the presence or absence of natural calcium carbonate in soils. "Of 126 surface soils examined for calcium carbonate and reaction, only five of those containing calcium carbonate reddened blue litmus paper. All the soils which gave an alkaline reaction with red litmus contained calcium carbonate. . . .

"The total phosphorus content of the soils studied varied from 0.3 per cent, or 6,000 lbs., per acre to 0.025 per cent, or 500 lbs., of phosphorus per acre in 6 in. of soil." Fourteen showed the presence of more than 0.1 per cent of total phosphorus. Soils containing calcium carbonate showed a larger supply of total phosphorus than the noncalcareous soils. The average phosphorus content of calcareous surface soils was 1,310 lbs. per acre, compared with 913 lbs. and 986 lbs. for the noncalcareous soils from the eastern and western sections of the State.

Black clay loams of limestone origin contained the most total phosphorus followed in order by the calcareous clays and clay loams. Alkaline soils containing natural calcium carbonate contained more available phosphorus (soluble in fifth-normal nitric acid) than acid soils. Calcareous sands and sandy

loams had a larger proportion (30 per cent) of their total phosphorus available than did silts and clays. The noncalcareous sands and sandy loams contained approximately the same amount of available phosphorus as the calcareous silts and clays. The calcareous black clay loams contained more available phosphorus than any of the other classes of soils, except the calcareous sands and sandy loams. The noncalcareous silts and silt loams and acid clays and clay loams were deficient in available phosphorus.

The analytical methods employed are outlined.

The red clay soil of Porto Rico, P. L. GILE and C. N. AGETON (*Porto Rico Sta. Bul. 14* (1914), pp. 24, pl. 1).—This bulletin reports chemical studies and fertilizer experiments with the red clay soil, which is one of the most extensive soil types of Porto Rico. The soil is a fairly heavy clay underlain by an impervious subsoil, and requires good cultivation and drainage to be productive. It is characterized chemically by a high content of iron and aluminum, moderate amounts of nitrogen, phosphoric acid, and potash, and no carbonates. It is almost uniformly acid and frequently low in organic matter.

The soil is used chiefly for the production of coffee and sugar cane, and where it has been for a long time continuously in cane certain areas have become sick or tired and do not respond to fertilizers or superficial disinfection.

Fertilizer experiments carried on with sugar cane showed, however, that the normal soil is benefited by liming and fertilizers, and that nitrogen is the constituent most needed and probably increases the yield as much as a complete fertilizer. The cause of the unproductiveness of the sick soils was not determined.

Soils, G. AUCHINLECK (*Imp. Dept. Agr. West Indies, Rpt. Agr. Dept. Grenada, 1912-13, pp. 11-14*).—Physical analyses and data obtained by determinations of shrinkage and friability (E. S. R., 27, p. 120) of red, black, and gray soils originating from the weathering of lava and from the deposition of volcanic ash, mud, sand, or gravel are reported. The red soils are heavier than the black and the water content when air-dried is higher. "The gray soil is lightest of all, probably containing a larger amount of unweathered fragments."

Studies of meteoric waters, soil, and air at the observation stations of the Charcot expedition, A. MÜNTZ and E. LAINÉ (*Ann. Inst. Nat. Agron., 2. ser., 12* (1913), No. 2, pp. 179-231, figs. 7).—The results reported in part 1 of this article, relating to nitrates and ammonia in meteoric waters, have already been noted from another source (E. S. R., 26, p. 515). The second part relates to unsuccessful attempts to isolate active nitrifying organisms from samples of debris collected from icebergs, it being impossible to obtain samples of true soil in the antarctic regions in which these observations were made. The third part reports examinations showing that the carbon dioxide content of the air of the antarctic region is decidedly smaller than that of temperate or tropical regions, the average found being about 2 parts per 10,000 parts of air. The oxygen content was found to be about the same as that of other regions.

The nitrifying efficiency of certain Colorado soils, W. G. SACKETT (*Colorado Sta. Bul. 193* (1914), pp. 3-43, figs. 3).—Continuing his investigations into the causes of the excessive accumulation of nitrates in Colorado soils (E. S. R., 28, p. 31), the author made a detailed study of the nitrifying efficiency of these so-called "niter" soils as well as of soils from various places outside of the State. The term "nitrifying efficiency" is used in this connection "to denote not only the presence of the nitrifying organisms in the soil which are capable of exercising their specific function under favorable conditions (nitrifying power) but also the suitability of the soil as a medium in which the process of nitrification may proceed advantageously (nitrifying capacity)."

The conclusions reached are in brief as follows:

"Many cultivated soils of Colorado contain a vigorous nitrifying flora capable of transforming ammonical nitrogen into nitrate nitrogen. Both . . . normal soils and those in the incipient stage of the niter trouble possess this power in a very marked degree.

"Compared with soils from twenty-two other localities outside of the State, the Colorado soils examined are very superior in nitrifying efficiency. The nitrifying efficiency of Colorado soils bears an inverse relation to that of the foreign soils when referred to ammonium sulphate, ammonium carbonate, and dried blood as the nitrifiable substances. Colorado soils produced their highest average grains in nitric nitrogen from $(\text{NH}_4)_2\text{SO}_4$, the next largest from $(\text{NH}_4)_2\text{CO}_3$, and the lowest from dried blood. The foreign soils produced their largest average yields in exactly the reverse order. The nitrifying flora of the Colorado soils is distinct from that found in the majority of the foreign samples; it is either made up of entirely different organisms, or, if the same organisms, they behave like different strains.

"Excessive nitrates do not appear to interfere seriously with nitrification provided the chlorin is low. Excessive chlorin, with or without excessive nitrates, inhibits nitrification. Active nitrification takes place in the brown crust from the niter spots provided the chlorin is not excessive. The sample of raw adobe clay examined was deficient in nitrifying efficiency.

"The results of this study together with those of . . . two previous investigations justify the position that the excessive nitrates present in certain Colorado soils have resulted from the combined action of nitrogen-fixing, ammonifying, and nitrifying organisms."

An examination of some more productive and some less productive sections of a field, T. L. LYON, J. A. BIZZELL, and H. J. CONN (*New York Cornell Sta. Bul.* 338 (1913), pp. 51-115, figs. 12).—This bulletin reports physical and chemical examinations of the soils of productive and unproductive sections of the same field as well as studies of the bacterial flora of the soils.

Aeration increased, temporarily, the formation of nitrates and the productiveness of the poorer soil beyond that of the better. When the whole area was divided into small plats and cropped with millet for four years, there was a fairly constant relation in the yields of both productive and unproductive plats.

Neither type of plat was distributed with any definite relation to the topography of the area. Mechanical analyses of the soils showed that the texture underwent a gradual change from the upper to the lower part of the area, but there was no constant relation between the productiveness of the plats and their mechanical composition, and chemical analyses showed no great difference in the inorganic constituents.

The soils in the lower yielding plats were more compact than those in the higher yielding plats. "The more compact condition of the soil was less favorable to the formation of nitrates, and thus the qualities of productiveness, compactness, and rate of formation of nitrates are correlated." It is therefore concluded "that a too compact condition of the soil is the cause of the lessened productiveness of certain small sections of this soil for the growth of certain crops."

Conclusions of a general nature from the studies of the bacterial flora of these soils are as follows: The flora of soil is quite different from that of other natural media, consisting primarily of strict aerobes that do not produce spores, the majority of which liquefy gelatin very slowly and grow but poorly in the ordinary bacteriological media. Certain types of bacteria may occur throughout the year, growing in winter and in summer alike, while others grow

for short periods only. There is an intimate connection between the moisture content and the numbers of bacteria, the most striking exception being in winter when the germ content increases if the soil is well frozen, but decreases after a thaw.

In comparing the productive and unproductive plats, no type of bacteria found frequently in one soil was lacking in the other, and during the winter the total numbers of bacteria were higher in the more compact and less productive soil. The quantitative difference between the two soils lay wholly in the group of slow-growing organisms, and rapid liquefiers were often fewer in the less productive soil.

"At the end of the experiment the relative numbers of liquefiers had decreased and those of slow growers had increased in the less productive plat; while in the other plat this tendency had been almost unnoticeable."

A classification of the organisms and a bibliography of related works are appended.

The rational improvement of Cumberland Plateau soils, C. A. MOORE (Tennessee Sta. Bul. 101 (1913), pp. 99-138, figs. 6).—This bulletin, a continuation of work previously reported (E. S. R., 26, p. 422), points out the special plant food needs of the Cumberland Plateau soils which are mainly fine sandy loams deficient in lime and phosphoric acid, and reports 6 years' experiments to determine as far as possible, how much fertilizer to use on different crops in order to get the best practical results. Acid phosphate, muriate of potash, sodium nitrate, and cotton-seed meal are recommended as being the most profitable sources of plant food for general use. The importance of green manuring, soil inoculation, and crop rotation is pointed out as is also the relation of the potato crop to soil improvement.

The results of crop fertilization experiments were as follows: Fertilization of potatoes with 1,500 lbs. per acre of a mixture of 1, 6, and 8 parts, respectively, of muriate of potash, acid phosphate, and cotton-seed meal was on the average more profitable than 750 lbs. per acre of the same mixture. Sodium nitrate was only slightly more efficient for potatoes than cotton-seed meal. Fertilization of potatoes with manure showed the necessity of reinforcing the manure particularly with phosphoric acid. The best time for applying sodium nitrate to corn and potatoes was found to be at an early stage of growth for both crops. Acid phosphate alone in moderate quantity was as profitable for corn "as any other material or combination of materials of equal money value." A light manuring, supplemented by acid phosphate, is recommended for corn, and acid phosphate for a green manure or pasture crop which is to be followed by corn. Only a very light application of potash salt was needed for corn. The use of sodium nitrate was not generally profitable for corn. However, the results of tests of different fertilizer combinations "seems to justify the use of a complete fertilizer for corn on very poor soils like these."

On soils similar to the Plateau soils acid phosphate and sodium nitrate with a small amount of muriate of potash gave profitable results with millet. The general requirements for success with alfalfa, red, white, crimson, and alsike clovers, Lespedeza, melilotus, cowpeas, soy beans, Canadian field peas, spring oats, peanuts, small grains, grasses, buckwheat, and sorghum on these soils appear to be liming and phosphating, although some require soil inoculation, sodium nitrate, and manuring.

A list of crop rotations is suggested, including 5 and 4-year rotations for general farming and 3 and 4-year rotations for potato growing accompanied by a table to serve as a guide during the establishment of the 5-year general farming rotation.

The rational improvement of Highland Rim soils, C. A. MOORE (Tennessee Sta. Bul. 102 (1914), pp. 44, figs. 8).—This bulletin deals in substantially the same manner with the Highland Rim soils as the bulletin noted above deals with the Cumberland Plateau soils, including some of the same field experiments with crops and fertilizers, and reaching practically the same conclusions as to the fertilizer requirements of potatoes, corn, and other crops on the soils of the two areas.

"The results of field experiments conducted in several different counties have demonstrated repeatedly that phosphoric acid is greatly needed by all the Rim soils, that liming is nearly always profitable, and that potash is often needed by the gray soils."

Experiments with corn following pasture and green manure crops on the very poor gray-colored soils of the area "afford a striking demonstration of the rapidity with which even a poor soil responds to proper treatment . . . and show both the marked increase in yield which may be brought about by the pasturing off of legumes, such as cowpeas and soy beans, and the great value of acid phosphate rightly used."

Fertilization of tobacco with 800 lbs. per acre of a mixture of potassium sulphate, acid phosphate, and cotton-seed meal 1:3:4 gave profitable results. Little difference was observed between sodium nitrate and cotton-seed meal as sources of nitrogen for tobacco. The use of farmyard manure increased the tobacco crop, but 6 tons of manure per acre together with 800 lbs. of the complete fertilizer noted above proved more profitable than either used alone. Tobacco was not directly benefited by liming.

A list of crop rotations is suggested including a 5-year rotation for general farming, a 3-year rotation for green manure and grain and one for general farming, and two 2-year rotations for pasturing hogs, accompanied by a table to serve as a practical guide during the establishment of the 5-year general farming rotation.

The applications of electricity to agriculture, T. T. BAKER (*Jour. Roy. Soc. Arts*, 62 (1913), No. 3186, pp. 70-78, figs. 2; *abs. in Jour. Soc. Chem. Indus.*, 33 (1914), No. 1, p. 35).—An account is given of the application of high-tension electric currents to soil by means of overhead wires (particularly the Lodge-Newman system) for the purpose of increasing the yield of crops.

Reference is also made to experiments with waste material from radium manufacture mixed with the soil. It is stated that "good results have been obtained by mixing 1 part of radio-active material (2 mg. Ra per ton) with 10 of soil; with considerably larger quantities the yield was diminished and growth retarded. Some crops were benefited to a much greater degree than others. Good results have been obtained with radishes and wheat, but much less marked improvement with cress; in the case of radishes the sugar content also was markedly increased."

The relation of fertilizers to soil fertility, F. B. GUTHRIE (*Dept. Agr. N. S. Wales, Sci. Bul. 9* (1913), pp. 34).—This is a short survey of present views on the subject, including especially summaries of the results of investigations relating to toxic substances in soils, sick soils, and catalytic fertilizers. A rather full bibliography of literature relating to catalytic fertilizers is given.

The use of commercial fertilizers, J. F. BARKER (*New York State Sta. Circ. 26* (1914), pp. 20).—This circular presents in a popular way certain well established facts regarding the elements required for plant growth, the composition of the soil as related to the use of fertilizers, the teachings of the more carefully planned and conducted experiments with fertilizers which have been made in this country, and the home mixing of fertilizers.

The presentation of well grounded facts relating to fertilizers is considered by the author important at this time because of the "many conflicting theories and much unsound teaching on the subject of soil fertility," and because of his observation in New York "that, even at the present time, fertilizing practice is influenced more by the advertising agencies of the various fertilizer concerns than by the results of work at the agricultural experiment stations throughout the country."

Mixed applications of calcium cyanamid and sodium nitrate, P. BOLIN (*Meddel. Centralanst. Försöksv. Jordbruksområdet*, No. 79 (1913), pp. 8; *K. Landtbr. Akad. Handl. och Tidskr.*, 52 (1913), No. 4, pp. 276-281; *abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases*, 4 (1913), No. 9, pp. 1356-1358).—In experiments with oats calcium cyanamid was less effective than sodium nitrate, but mixtures of the two were more effective than either alone and were more economical than nitrate alone.

The possibility of using crude phosphates and limes containing silica as manures, T. PFEIFFER (*Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases*, 4 (1913), No. 9, pp. 1316-1321).—This article is substantially the same as one already noted (*E. S. R.*, 29, p. 520).

Ground limestone for soil improvement, J. F. BARKER (*New York State Sta. Circ.* 27 (1914), pp. 14).—Information on the subject drawn from various sources is presented in popular form in this circular which treats of solubility of limestone, function of carbonates in soils, chemistry of limes, comparative experiments with ground limestone and burned lime, limestone versus caustic lime, fineness of ground limestone, and methods of applying limestone. A list of companies in New York producing ground limestone or marl for agricultural use is appended.

Pennsylvania limestone and lime supplies, W. FEAR (*Pennsylvania Sta. Bul.* 127 (1913), pp. 71-106).—This is a compilation and brief discussion of analyses of limestones from the various deposits in the State of which 54 are sufficiently definite to have received distinguishing names. The limestone formations are classified in their geological order beginning with those of most recent age. A compilation of analyses of commercial lime products is also given.

Trials with molasses as a sugar-cane manure or fertilizer, and with chlorinated lime as a soil ameliorant, J. B. HARRISON and R. WARD (*Jour. Bd. Agr. Brit. Guiana*, 6 (1913), No. 3, pp. 123-126; *Internat. Sugar Jour.*, 15 (1913), No. 176, pp. 373-375; *abs. in Chem. Abs.*, 8 (1914), No. 4, p. 774).—In experiments in which diluted molasses was used at rates of 100, 200, and 300 gal. per acre the average results for 3 years showed a slight increase for plats treated with molasses, but this increase is attributed solely to the nitrogenous matter contained therein. In experiments in which 150 lbs. per acre of chlorinated lime was applied in solution to a stiff clay soil the yields on the treated plats were but slightly larger than those obtained on the untreated plats.

Trials with molasses as a sugar-cane manure, W. P. EBBELS (*Internat. Sugar Jour.*, 15 (1913), No. 177, p. 427; *abs. in Chem. Abs.*, 8 (1914), No. 4, p. 774).—Referring to the experiments noted above it is stated that the negative results were probably due to the fact that the molasses was not applied at the proper time, viz, three or four months before the cane was planted and in the holes made to receive the cane.

The fertilizing action of sulphur on grapes, V. VERMOBEL (*Bul. Soc. Nat. Agr. France*, 74 (1914), No. 1, pp. 48-51).—Marked benefit was derived from the use of sulphur (178.5 to 357 lbs. per acre), especially when applied in connection with manure. The effect of the sulphur decreased as the amount of manure applied diminished.

The action of manganese in soils, J. J. SKINNER, M. X. SULLIVAN, ET AL. (*U. S. Dept. Agr. Bul. 42 (1914), pp. 32*).—Previous investigations both by the Bureau of Soils and by others bearing on this subject are reviewed, and pot and field experiments as well as culture experiments with extracts of good and poor soils are reported.

It was found that manganese chlorid, sulphate, nitrate, carbonate, and dioxid had a stimulating effect on wheat grown in an unproductive sandy loam soil. The best results were obtained when the salts were applied in amounts furnishing from 5 to 50 parts of manganese per million of soil. When the maximum rate named was exceeded there was no corresponding increase in growth, and in some cases there were even harmful results. On productive loam the various salts of manganese had no stimulating effect.

With aqueous extracts of poor unproductive soils the manganese salts increased oxidation and growth. In the case of productive soils oxidation was increased but growth was decreased, the plants showing indications of excessive oxidation.

In a 5-year field test with wheat, rye, corn, cowpeas, and potatoes grown on an acid silty clay loam soil manganese sulphate used at the rate of 50 lbs. per acre had a harmful effect on all of the crops grown. Its addition decreased the oxidizing power of the soil, which at best was not very high. The acid condition of the soil was unfavorable to oxidation and catalysis, and the catalytic power was slightly, if at all, increased by the addition of manganese sulphate.

The general conclusion is "that manganese is not profitable as a soil treatment on soil of this nature in need of liming."

Commercial fertilizers: Inspection 1913, B. H. HITE and F. B. KUNST (*West Virginia Sta. Insp. Bul. 2 (1914), pp. 39*).—This bulletin gives the guaranteed and actual analyses of fertilizers inspected during 1913. The average composition of the fertilizers examined during the year was available phosphoric acid 10.46 per cent, potash 2.74, and nitrogen 0.46. The corresponding averages five years ago were 9, 2.5, and 0.41 per cent, respectively. The fertilizers of which analyses are reported in this bulletin are classified as low-grade if the total of available phosphoric acid, ammonia, and potash claimed in the guaranty falls below 12 per cent, high-grade if the sum is 14 per cent or over, and medium if between 12 and 14 per cent. Farmers are advised not to buy fertilizers containing less than 14 per cent of available plant food, including at least 1.65 per cent of nitrogen.

AGRICULTURAL BOTANY.

The chemical dynamics of living protoplasm, W. J. V. OSTERHOUT (*Abstr. in Science, n. ser., 39 (1914), No. 999, p. 292*).—The author claims that by measuring the electrical resistance of living tissues it is possible to follow the progress of reactions in protoplasm and that it is possible to apply van't Hoff's methods and formulas to protoplasm in its living and active condition.

As an example of the application a brief description is given of experiments with *Laminaria* in sodium chlorid solutions. From this experiment the author concludes that "since the effect of sodium chlorid is within wide limits completely reversible, without production of injury, the conception of chemical dynamics here developed applies not only to reactions which produce death, but also to reactions which involve no injury and which form a normal part of the activity of the cell." This conclusion, it is said, is confirmed by experiments with a variety of other substances.

The chemical behavior of inorganic nitrogenous plant food materials in sunlight, O. BAUDISCH (*Vierteljahrsschr. Naturf. Gesell. Zürich, 58 (1913), No. 1-2*,

pp. 10-14).—Noting briefly recent experiments of his own, the author concludes that from inorganic nitric compounds in sunshine in the presence of formaldehyde more complex nitrogen compounds are formed, this fact furnishing on the chemical side support for the view that assimilation of nitrates and nitrites is a photochemical process.

Contributions regarding the effect of manganese and aluminum on plant development, II, T. PFEIFFER and E. BLANCK (*Landw. Vers. Stat.*, 83 (1913), No. 3-4, pp. 257-281).—The authors, reporting further studies (E. S. R., 28, p. 328) state that manganese salts but slightly increased the production of dry substance in small grains, but that the organic substance was considerably increased. Aluminum sulphate in small quantities with small proportions of manganese sulphate showed only a slight stimulation of yield, while the addition of aluminum rapidly decreased the returns, exceeding manganese in this respect. These investigations are said not to have borne out the claim of Stoklasa (E. S. R., 25, p. 522) regarding the neutralization by aluminum of the injurious effects of the manganese salt.

Influence of metals on development of *Aspergillus niger* in Raulin's liquid, M. BORNAND (*Centbl. Bakt. [etc.]*, 2. Abt., 39 (1913), No. 18-19, pp. 488-496, figs. 4).—It is stated, as a result of a study of *A. niger* in Raulin's fluid in contact with metallic platinum, aluminum, silver, copper, iron, tin, lead, zinc, and nickel, that the growth of this fungus is rather hindered than promoted by the presence of all but the first two, and that normal development is not shown after the substitution of iron and zinc for their salts used in Raulin's fluid.

A contribution to the theory of antagonism, W. J. V. OSTERHOUT (*Abs. in Science*, n. ser., 39 (1914), No. 999, p. 292).—It is claimed that by means of electrical measurements of living tissues it is possible to predict which salts will antagonize each other when allowed to act upon these tissues.

The effect of antagonistic or balanced solutions containing sodium chlorid together with one of the chlorids of calcium, magnesium, potassium, strontium, ammonium, or copper, upon the growth of corn plants rooted in an artificial soil, J. S. CALDWELL (*Abs. in Science*, n. ser., 39 (1914), No. 999, p. 293).—A preliminary account is given of experiments carried on with each of the 6 pairs of salts to determine their effect on plants grown in finely divided quartz. For each pair of salts 10 to 20 different concentrations were used, varying from the lowest concentration that inhibited development to a dilution so great as to be without effect upon the plants. In all cases results were measured by comparing the dry weights of the roots and tops taken separately, the cultures being allowed to grow under controlled conditions for 30 days.

Antagonism was observed between sodium and strontium at all molecular ratios between 10:1 and 20:1, and in all concentrations between those just permitting measurable development and those too dilute to have any discoverable effect, except that of root development. The effect of the additions of calcium to sodium was merely to decrease the characteristic physiological and morphological effects of sodium in a degree directly proportional to the amount added, the effect being one of dilution and not of antagonism.

In mixtures with copper, sodium served merely to dilute the copper salt, decreasing the toxic or stimulatory effect directly proportional to the amount added, but in no case annulling the effects of the copper salt.

Additions of magnesium to sodium in any proportions or at any concentrations were without effect upon the development of the aerial parts. In highly toxic concentrations mixtures in the ratio of 2:1 gave somewhat better development of roots, while in all stimulatory concentrations of 1:1 gave the best

dry weight of roots. Mixtures of sodium and potassium inhibited development of both roots and tops in all inhibitory or toxic concentrations to a markedly greater extent than did isosmotic solutions of the pure salts. In stimulatory concentrations the pure salts permitted greater and more normal development than mixtures. Sodium in any proportion decreased the stimulatory effect of potassium.

For mixtures of sodium with ammonium, highly toxic concentrations permitted slightly greater development when the two ions were present in the ratio of 1:1. For stimulatory concentrations the stimulating effect was decreased in mixtures, growth becoming better as the ratio of one ion to the other increased from 3:1 to 60:1.

The harmful action of distilled water, R. H. TRUE (*Abs. in Science, n. ser., 39 (1914), No. 999, pp. 295, 296*).—Attention is called to the injurious action of distilled water, the author stating that samples which show the highest resistance are in general more harmful to lupine roots than waters containing a large quantity of electrolytes. The primary cause of injury is said to be the extraction of electrolytes and perhaps of other substances as well. This is regarded as a special case of the general type of injury wrought on cells by unbalanced solutions. The distilled water seems to withdraw the material required for the maintenance of the efficient action of the protoplasmic limiting membranes, with the result that the permeability of the cells is increased and a further dissociation of the electrolytes from their combination in the proteids and other chemical structures of the cell ensues.

In a subsequent paper the author calls attention to the need of plant physiologists for a normal physiological solution in which to conduct their experiments.

Radio-activity and vegetation, M. VACHER (*Génie Rural, No. 49-50 (1913), pp. 8-12, figs. 4*).—This is a somewhat abridged form of an article previously noted (*E. S. R., 30, p. 29*) from another source.

The physiology of the rest period in potato tubers, C. O. APPLEMAN (*Abs. in Science, n. ser., 39 (1914), No. 999, p. 294*).—The author claims that the rest period of potato tubers is not firmly fixed and hereditary, as it may be eliminated by various agencies.

Biochemical study of after-ripening in the potato tuber, C. O. APPLEMAN (*Abs. in Science, n. ser., 39 (1914), No. 999, p. 294*).—Attention is called to the fact that under normal conditions potato tubers will not sprout for several weeks after harvest, or until certain changes have taken place in the buds or their immediate environment. These changes are spoken of as after-ripening.

In the author's experiment tubers were cut in half and analyses made separately of the seed and stem halves, with the view to detecting the chemical changes characteristic of after-ripening. The carbohydrate transformations were dependent entirely upon changing temperatures. Active diastase was present at all stages of the rest period and showed no increase during natural after-ripening. Protein, lipid, organic extractive, and inorganic phosphorus, calculated as total phosphorus, each remained constant up to the time of sprouting. It appears that after-ripening does not involve proteolysis or other changes in the various nitrogen combinations.

The metabolic changes involving the above substances as well as others are said to begin rather suddenly, are concurrent with sprouting, and are therefore not primary processes of after-ripening.

Metabolic changes in potato tubers during sprouting, C. O. APPLEMAN (*Abs. in Science, n. ser., 39 (1914), No. 999, pp. 293, 294*).—The author presented an account of investigations the practical application of which has been noted elsewhere (*E. S. R., 29, p. 230*).

It was found that under constant storage temperature starch was depleted while the reducing sugars showed a slight increase, the carbohydrate changes being more rapid in the stem end of the tubers. Both diastase and invertase activity was doubled, the increase being greater in the stem half of the potato. Catalase showed a marked increase, which was slightly greater in the juice from the seed end. The nitrogen of monamino acids and their amid derivatives increased, while that of the diamino acids and other organic bases and the water insoluble protein nitrogen decreased. The abundant water soluble protein nitrogen in the tubers showed a very slight increase during sprouting. Organic extractive and lipid phosphorus increased at the expense of protein and inorganic phosphorus. The increase in lipid phosphorus began earlier and increased more rapidly in the seed end. The decrease in inorganic phosphorus occurred in the seed end only. In many cases the metabolic activity was found greater in the stem half, although the sprouts were all borne on the seed end of the tuber.

Differential permeability, W. J. V. OSTERHOUT (*Abs. in Science, n. ser.*, 39 (1914), No. 999, p. 293).—Attention is called to the differences in permeability possessed by various kinds of surfaces in the cell, such as the plasma membrane, the vacuole-wall, the nuclear wall, the surface of the chromatophore, and the cell wall. The author suggests the term differential permeability as an appropriate designation of these phenomena.

Inefficacy of cultivation for destroying weed seeds, O. MUNERATI (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat.*, 5. ser., 22 (1913), I, No. 2, pp. 120–126; *abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases*, 4 (1913), No. 4, pp. 661, 662).—The author concludes a briefer account of recent work (*E. S. R.*, 30, p. 332) by stating in substance that the age of weed seeds has usually much more to do with the time and percentage of germination than do such conditions as moisture and depth below the surface; that slow germinability favors persistence of weeds; that superficial or frequent working of the soil does not necessarily destroy many weed seeds; and that the only method that is certainly efficacious in checking propagation of harmful weeds is their destruction before the seeds ripen and fall to the ground.

Recent contributions on problems regarding mycorrhiza, J. PEKLO (*Ztschr. Gärungsphysiol.*, 2 (1913), No. 4, pp. 246–289; *abs. in Ztschr. Bot.*, 6 (1914), No. 3, pp. 293–295).—This is a detailed account of recent studies by the author and others on the cytology and physiology of fungal mycorrhiza in nutritive relation with pine and fir, more particularly as regards the assimilation of atmospheric nitrogen, which some are claimed to be able to accomplish.

The counting of protozoa in soil, J. KILLER (*Centbl. Bakt. [etc.]*, 2. Abt., 37 (1913), No. 17–21, pp. 521–524).—The author discusses methods of counting soil protozoa, emphasizing the proper procedure and precautionary measures for obtaining accurate results.

Tests of different concentrations of seven different nutritive solutions inoculated with different soil solutions showed that the chemical composition of the culture medium and the concentration of the nutritive solutions exerted a marked influence on the kind and powers of development of the soil protozoa. It is concluded that the values of all counting methods are limited and that a knowledge of the effect, intensity, and nature of the activity of the soil protozoa is much more important.

Studies of teratological phenomena in their relation to evolution and the problems of heredity.—I, **A study of certain floral abnormalities in Nicotiana and its bearing on theories of dominance**, O. E. WHITE (*Amer. Jour. Bot.*, 1 (1914), No. 1, pp. 23–36, figs. 4; *abs. in Science, n. ser.*, 39 (1914), No. 998, p. 255).—Studies are reported of races of *Nicotiana* showing petalody,

pistillody, and catacorolla which were crossed with normal plants. The data secured indicate that dominance and recessiveness are not in any way attributes of the factor or character in itself, but are the result of the factor expression plus the modifying influence of the environment.

Notes on root variation in some desert plants, W. A. CANNON (*Plant World*, 16 (1913), No. 12, pp. 323-341, figs. 4).—Reporting studies on a number of desert plants, the author states in substance that root systems of desert perennials may be roughly classed as generalized or specialized. The former, as in case of *Franseria dumosa*, are capable of greater variation than the latter, such as cacti. Under cultural (garden) conditions *Opuntia arbuscula* and *O. neoarbuscula* were not modified by an unaccustomed depth of soil and water, as were, however, *O. spinosior*, *O. vivipara*, and *O. discata*. Variations were experimentally induced as to length of roots in a number of plants named, grown in tubes, the roots of all these showing increase in length.

FIELD CROPS.

Growing crops and plants by electricity, MISS E. C. DUDGEON (*London*, [1913], pp. VIII+36, figs. 12).—The author reviews briefly some work of other investigators on this subject and gives some results of her own experiments.

Potatoes grown under electrical influences in the field produced from 12 cwt. 12 lbs. to 2 tons 4 cwt. per acre more than those grown on the control plots. "It is also evident that some crops respond to the treatment better than others; in all the experiments there has been a distinct advance in the percentage of wheat, in potatoes the returns vary considerably, with a few exceptions leguminous plants are adversely affected, but a curious point in connection with these plants is that grown in rotation they have an opposite effect upon the soil to cereals."

Experiments with the mercury vapor lamp in the greenhouse on the germination of French beans, carrots, cauliflowers, lettuce, Maple peas, oats, barley, and wheat showed a shortening of the germination periods ranging from 5 to 20 days. Filbasket peas matured 3 days earlier under the mercury vapor lamp than in the control pots.

Experiments on the influence of electricity upon plant growth, W. SCHIKORRA (*Mitt. Kaiser Wilhelms Inst. Landw. Bromberg*, 5 (1913), No. 5, pp. 403-411, fig. 1).—In this article the author discusses the work of other investigators and gives some results of his own experiments with pot cultures. The method of applying the electricity is fully described. The current, 35,000 to 40,000 volts, is taken from a machine and made to jump a distance of 15 cm. from a copper wire point suspended over each pot to an upright copper wire point in the center of the pot.

The results of connecting the suspended point with either the positive or negative pole showed an injurious effect of the current on rye and winter barley when applied during a period of from 16 to 20 days at intervals amounting to a total of from 42 to 51 hours. The decrease in yields amounted to from 11.3 to 14.8 per cent.

In another experiment in which the charge received by the pots was reduced, rye showed an increase of 0.4 per cent and winter barley an increase of 11.6 per cent in yield after a period of 70 days, during which the treatment occurred for a total of 243 hours. When the copper points in the pots were removed, barley showed an increase of 8.9 per cent and oats of 16.1 per cent in yield of dry matter over no treatment.

The experiments described above were carried on in an inclosed room. When the work was transferred to the open, the atmospheric moisture interfered with

uniform discharges and resulted in yields varying from 5.1 per cent increase to 16.6 per cent decrease over no treatment. In studying the effect of electrical discharges upon transpiration and evaporation it was found that when the discharge took place from points placed 13 cm. above a water surface, evaporation took place much more rapidly than from an untreated surface, ranging from 5 to 10 times greater.

Experiments in the application of electricity to crop production, J. H. PRIESTLEY (*Jour. Bd. Agr. [London]*, 20 (1913), No. 7, pp. 582-594, fig. 1).—In this article further work (E. S. R., 23, p. 326) is reported upon attempts to study the effect of electricity on growing crops. Some results of previous investigators are discussed, and methods employed in the author's experiments briefly described, in which wires carrying the current were stretched over the area to be tested.

It was found that because of the wind the effect of the electrical discharge was not confined to the area under the wires, and that control plats would have to be located at least 100 yds. distant. The yields of potatoes from the treated and the control plats were practically equal, but in further tests the treated area will be inclosed in wire netting to prevent the action of the wind.

Report of the agronomist, C. K. McCLELLAND (*Hawaii Sta. Rpt. 1913*, pp. 35-42).—It is noted that the results of rice experiments show the impossibility of producing rice in Hawaii equal in quality to that of Japan.

Cultural experiments with corn, small grains, grasses, forage crops, cotton, sorghums, sweet corn, and Irish potatoes, and the general field work of the substations at Waipio and Kula are also briefly noted. The new grasses most promising for hay and soiling crops are said to be Natal redbtop, Australian blue grass, Tunis grass, and Sudan grass.

[Field crops work at the Glenwood substation], F. A. CLOWES (*Hawaii Sta. Rpt. 1913*, pp. 52, 53).—Of 20 varieties of grasses tested the most promising were Para grass, Italian rye, Natal redbtop, *Paspalum dilatatum*, and rescue grass. Para grass yielded in 5 cuttings during 372 days at the rate of 70.7 tons of green fodder per acre. Large yields of green feed were also secured from oats sown from September to December. Notes on varieties and cultural tests with corn, sorghum, barley, soy beans, jack beans, and clovers are also given.

Experiments with leguminous plants, C. A. SAH2 (*Hawaii Sta. Rpt. 1913*, pp. 43-49, pl. 1).—This includes notes on cultural and variety tests of various legumes and descriptions of some new varieties in the tests, including *Stizolobium pachylobium*, soy beans, sword and jack beans, velvet beans, horse beans, asparagus beans, Sesbania, kulthi, *Dolichos lablab*, sunn hemp, stock or field peas, white navy beans, Lima beans, mungo beans, and a variety of Cuban peanut.

The Hawaiian method of brewing Japanese soy sauce and miso is described.

Botanical considerations affecting the care of grass land, R. G. STAPLEDON (*Jour. Bd. Agr. [London]*, 20 (1913), Nos. 5, pp. 393-399; 6, pp. 488-499).—The author presents the results of studying the botanical characteristics of grass land by determining the quality and quantity of the weed, leguminous, and gramineous flora, the ratio of valuable to useless grasses all the year round, "the condition of the useful plants in regard to the production of nutritious herbage, the nature of the aggregate root system of the pasture or meadow, the degree of productiveness of the several useful plants throughout the year, the quality and quantity of the moss flora throughout the year, and the factors affecting the foregoing considerations and their interrelations."

The 2 methods employed to determine the botanical constituents of a field were to count the plants in various areas of 6 by 6 in. or 1 by 1 ft. located in several parts of the field, both in the spring and late fall, and also to count the cut

herbage in the summer. To study the competitive relations of the root systems typical turf areas were lifted and the quantity of weed roots estimated.

The data as taken in various locations in England and also the care of grass land, including manuring and aeration, are discussed.

Pastures and pasture grasses for Utah, F. S. HARRIS (*Utah Sta. Circ. 15* (1913), pp. 35-42, pls. 2).—This describes 12 grasses and clovers suitable for pasture purposes in Utah, gives some seed mixtures, and directions for the planting and care of pastures.

Variety tests of field crops in Utah, F. S. HARRIS and J. C. HOGENSON (*Utah Sta. Bul. 131* (1914), pp. 319-346, pl. 1, fig. 1).—"This bulletin gives data on the yields of different varieties of wheat, oats, barley, corn, potatoes, and beans. The information was obtained from the following sources: (1) The station farms near Logan, (2) the dry-farm substation at Nephi, (3) cooperative tests with a number of good farmers in different parts of the State, and (4) correspondence with a large number of farmers. As a result of the tests it is impossible to say exactly what varieties are best, but with each crop there are a number of varieties that do well under almost all circumstances."

Division of cereals: Summary of results, 1913, C. E. SAUNDERS ET AL. (*Canada Expt. Farms Bul. 74* (1914), pp. 32).—Brief notes with some data on cereal variety tests at 15 experimental farms in Canada are reported.

Preparing land for grain crops on the prairies, J. H. GRISDALE (*Canada Expt. Farms Bul. 15, 2. ser.* (1913), pp. 23, figs. 7).—Methods of preparing land for crops in Saskatchewan, Alberta, and Manitoba with animal and tractor power are described in this summary of available data.

Experiments concerning the top-dressing of timothy and alfalfa, T. L. LYON and J. A. BIZZELL (*New York Cornell Sta. Bul. 339* (1913), figs. 4).—This continues work in rotation experiments, previously noted (*E. S. R.*, 21, p. 42; 23, p. 138), on a silty phase of Dunkirk clay loam in which "a series of field plats were subjected to a cropping rotation of timothy 3 years, corn, oats, and wheat each one year. Fertilizers or farm manure were applied to the timothy but not to any of the grain crops, different applications being used on different plats. The experiment has been conducted for 9 years.

"The results show that fertilization of the soil for timothy increases its productiveness for succeeding crops. The greatest benefit was derived by the corn crop, which immediately followed the timothy. The oat crop experienced the next greatest benefit, and the wheat the least.

"Tabulations of the financial gains demonstrate that the use of fairly large applications of fertilizers was profitable, resulting in as much as \$65 per acre net gain for the 6 years and giving a return of \$1.67 for every dollar invested in the fertilizer. Commercial fertilizers, while not superior to farm manure, were about equally effective. On grain crops commercial fertilizers are usually of less value than farm manure judiciously applied. This experiment indicates, therefore, that it is good practice to apply commercial fertilizers to timothy and thus save the farm manure for other crops.

"Alfalfa that had been growing for 6 years was laid off in plats, which were top-dressed with (1) farm manure, (2) acid phosphate, (3) acid phosphate and muriate of potash. All these treatments caused an increase in the yields of hay. Farm manure produced a financial loss; the other treatments resulted in monetary gains, acid phosphate applied singly being superior in this respect.

"Adjoining plats of land, on one of which alfalfa grew for 6 years and on the other of which timothy grew for the same length of time, were plowed, and were planted in one year to corn and in the next year to oats. The corn crop was considerably larger on the alfalfa land; the oats were equally good on the 2 plats. Analyses of the soils from the 2 plats showed that the alfalfa soil

contained not to exceed 0.01 per cent more nitrogen than did the timothy soil. When the soils were incubated, formation of nitrates proceeded more rapidly in the alfalfa soil than in the timothy soil.

"These data raise, but are not sufficiently exhaustive to answer, two questions: (1) Whether there was a greater accumulation of nitrogen in the alfalfa soil during the 6 years than there was in the timothy soil during the same period; (2) whether the greater productivity of the alfalfa soil was not due to the more ready availability of the nitrogen in the alfalfa soil rather than to its greater quantity.

"Plots of land that were to be sown to alfalfa were inoculated with (1) soil from an old alfalfa field, (2) a culture of *Bacillus radicola* in moist muck, (3) the same preparation air-dried, (4) a culture of the same bacillus on the seed. Yields of 3 crops were obtained from which it appears that moist muck is a suitable medium for the growth of *B. radicola* (the germ that forms nodules on the roots of alfalfa plants), and that this material may be air-dried and successfully used for the inoculation of soil on which alfalfa is to be planted."

[Wheat and rye in Turkestan], B. M. BENZIN (*Trudy Būro Prikl. Bot. (Bul. Angew. Bot.)*, 6 (1913), No. 7, pp. 457-495, pls. 6, figs. 6).—This gives descriptions and dimension data of spikes, spikelets, and kernels for each of 2 varieties of wheat and rye that are cultivated in Turkestan and which were found not to shatter grain readily when ripe.

A study of statistical methods with barley, W. O. WHITCOMB (*Jour. Amer. Soc. Agron.*, 5 (1913), No. 2, pp. 83-101).—The material used in this study consisted of 2 varieties of barley, known as New Zealand and Berkeley. Each variety consisted of 30 pure lines of 10 plants each or 300 plants in all.

A comparison of the constants for the 5 characters, yield per culm, height per culm, number of kernels per culm, number of spikelets per culm, and weight per kernel, "when determined by using the average for the entire plant as one method and the main culm of the same plant as the other method, indicate the following: (a) The means and standard deviations are quite uniform and are larger in most cases when determined with the main culm; (b) the coefficients of variability are slightly larger when determined by the use of the whole plant; (c) the correlation coefficients are not uniformly different when determined by the 2 methods, and are of approximately equal value, with some exceptions, when determined by either method.

"The general conclusion based on this study is as follows: Within certain limits, the biometrical constants as determined by using the main culm of barley plants are of equal value and are comparable with those obtained by using the entire plant as the unit."

Data are presented in 30 tables.

Experiments with beans (Poroto mantecoso), F. ALVAREZ (*Bol. Min. Agr. [Buenos Aires]*, 15 (1913), No. 3, pp. 289-292).—This gives results of cultural tests, including cost of production, at Bella Vista. The yield was at the rate of 1,752 kg. per hectare (1,559 lbs. per acre).

Ear characters not correlated with yield in corn, A. G. MCCALL and C. WHEELER (*Jour. Amer. Soc. Agron.*, 5 (1913), No. 2, pp. 117, 118).—The authors show by using data of complete records of ear-to-row test work furnished from the Ohio Experiment Station and a test field at Forest, Ohio, covering the years from 1905 to 1911 and including over 600 ears, "that so far as these tests are concerned neither length, weight, circumference, nor density of ear is correlated with yield."

Corn growing in Manitoba, W. C. MCKILICAN (*Canada Expt. Farms Bul.* 14, 2. ser. (1913), pp. 22, figs. 12).—This bulletin gives directions for the pro-

duction of corn in Manitoba and describes implements to be used, styles of silos, and silo filling.

Annual report of the Nebraska Corn Improvers' Association (*Ann. Rpt. Nebr. Corn Improvers' Assoc.*, 4 (1913), pp. 114, figs. 6).—This report contains among other data 15 papers on corn and wheat growing and related subjects, including some results given by W. M. Jardine of seed-bed preparation experiments conducted at the Kansas Experiment Station since 1907, from which "the main conclusion to be drawn is that large quantities of nitrates, or plant food as indicated by nitrates, are developed and stored in the soil as a result of early seed-bed preparation." Tabulated results for 1911-12 show that the wheat yields varied on the same scale as the nitrogen content of the soil to a depth of 3 ft., when determined in the spring and the fall of each year, for each of 10 methods of seed-bed preparation.

Report of variety tests of cotton for 1913, and a summary of results for the past eleven years, R. Y. WINTERS (*North Carolina Sta. Bul.* 226 (1914), pp. 15).—The results of tests at 3 locations showed that "at the experiment station farm the short staple varieties ranged in yield between 434.5 and 1,045 lbs. of seed cotton per acre. The 54 short staple varieties produced an average yield of 799 lbs. of seed cotton or 304 lbs. of lint and 495 lbs. of seed. The 15 long staple varieties ranged in yield between 479.5 and 927 lbs. of seed cotton, giving an average yield of 774 lbs. of seed cotton, or 264.5 lbs. of lint and 509 lbs. of seed."

"The 47 varieties of short staple cotton grown at the Edgecombe farm ranged in yield between 1,200 and 540 lbs. of seed cotton per acre. The varieties on this farm produced an average yield of 849 lbs. of seed cotton, or 313 lbs. of lint and 536 lbs. of seed per acre. The long staple varieties ranged in yield between 980 and 540 lbs. of seed cotton per acre and produced an average yield of 700 lbs. of seed cotton or 228 lbs. of lint and 472 lbs. of seed per acre."

At the Iredell farm, "ranging in yield from 300 to 1,560 lbs. of seed cotton per acre, the short staple varieties gave an average yield of 944 lbs. of seed cotton or 367 lbs. of lint and 577 lbs. of seed per acre. The above is a much broader range in yield than was secured at either of the other farms. Both the maximum and minimum yields exceeded the range of the other two. The long staple varieties ranged in yield between 350 and 960 lbs. of seed cotton per acre and produced an average yield of 768 lbs. of seed cotton or 263 lbs. of lint and 505 lbs. of seed."

Some of the best yielding varieties are noted to be Hawkins Extra Prolific, Shine Early Prolific, King Improved, and Cook Improved.

The Knapp method of growing cotton, W. B. MERCIER and H. E. SAVELY (*Garden City and New York, 1913*, pp. XV+208, pls. 33, figs. 4).—This book gives a history and description of the cotton plant, and treats of climate, soil culture, fertilizers, seed improvement, varieties, diseases and insect pests, harvesting, marketing, cost of production, equipment in teams and tools for cotton farms, cotton by-products, and soil improvement. It also discusses the outlook for the cotton industry and the supply and distribution of cotton.

Standard tests for hemp, G. E. ANDERSON (*Daily Cons. and Trade Rpts. [U. S.]*, 16 (1913), No. 280, p. 1111).—This notes a method of standardizing that is now being tested by the bureau of agriculture at Manila, in which the breaking strength of a meter length of fiber is divided by its weight in grams. It is hoped that the resulting gram-meter value will be an accurate index of the comparative strength and quality of the fiber.

Sisal hemp: Planting, manufacturing, and general management, D. J. STODDART (*Jour. Jamaica Agr. Soc.*, 17 (1913), Nos. 6, pp. 17-20; 7, pp. 14-18, pl. 1, fig. 1; 8, pp. 34, 35; 9, pp. 17-19; 10, pp. 12-14).—The hemp industry is

reviewed, and the cultivation, manufacture, and general management of hemp discussed with a view to Jamaican production. The topics covered are as follows: Description and varieties of sisal hemp plants; soil and its preparation; selection and method of cultivation; catch crops; maturity and harvesting; quality; machinery, drying stand, press, and buildings; artificial drying, baling, and bagasse; yields and values; and the fields as grazing pastures. Many of the data given are taken from Yucatan conditions.

Cultivation of main-crop potatoes (*Dept. Agr. and Tech. Instr. Ireland Jour.*, 13 (1913), No. 4, pp. 764-774).—This gives general directions for producing a potato crop in Ireland, and includes results of some tests by the department of agriculture in which potatoes were allowed to sprout before being planted. The average results obtained in every county in Ireland during the 10 years 1903-1912 showed that sprouted seed yielded 12 tons 5 cwt., and unsprouted seed 10 tons 6 cwt. per acre.

The advantages of storing potatoes during the winter in sprouting boxes are noted as follows: "(1) A substantial increase in yield; (2) planting may be deferred for a time in an unfavorable season without detriment to the crop; (3) several weeks' growth is secured in the boxes previous to planting; the first bud is preserved, which results in the crop making rapid growth when planted, enabling it to smother weeds; (4) the crop is usually ready for lifting several weeks before that from unsprouted seed; (5) seed potatoes can be safely and conveniently stored in boxes and easily examined for the removal of unsound tubers or for the detection of those of other varieties which may have been accidentally introduced."

Results are given of manurial experiments with potatoes conducted at 353 centers during the 11 years, 1901-1911.

Potato production from experience, G. M. TWITCHELL (*Ann. Rpt. N. J. Bd. Agr.*, 40 (1912), pp. 140-149).—This paper, which was delivered at the fortieth annual meeting of the New Jersey State Board of Agriculture, deals with the production of the potato crop as developed in Maine. The methods employed in establishing different types of potatoes are described. It is noted that by protecting the vines and increasing the leaf development a potato of increased starch content may be obtained, and that the use of Paris green injures the leaf surface and delays elaboration therein.

Some experiments on the growth of rice in water culture, V. E. VILLEGAS (*Philippine Agr. and Forester*, 2 (1912), No. 4-6, pp. 86-90).—The results given in this paper were obtained in a study of the inferior crop-producing power of cogon soils. Rice plants were grown in water cultures with and without an extract from cogon soils, in the presence of various nitrogen compounds, and in the presence of a soil extract obtained from under a clump of bamboo.

The results obtained showed that "rice grown in water culture containing substances extracted from cogon soil is generally retarded in its growth; where sodium nitrate is the predominating fertilizer stimulation of growth is observed. The extract from a soil growing bamboo retards the growth of rice in every case, though the effect observed is less in the case of the plant grown in a solution containing sodium nitrate as the sole nutrient salt. . . . It is evident that the removal of nitric acid from the solutions containing sodium nitrate will tend to develop an amount of alkali sufficient to neutralize more or less completely the acidity due to superphosphate. In fact the solutions containing predominating proportions of sodium nitrate were the only ones which were neutral at the end of the experiment. . . . We, therefore, conclude that cogon soil and soil growing bamboo contains a substance or substances injurious to the growth of rice in acid media; whether the toxic action would

be noticed if the plants were grown in neutral or slightly alkaline media remains for further investigation."

Tabulated data are given.

The influence of salts common in alkali soils upon the growth of the rice plant, K. MIYAKE (*Jour. Biol. Chem.*, 16 (1913), No. 2, pp. 235-263).—From the results of 2 experiments to determine the influence of single salts upon the growth of rice seedlings the author concludes that "the alkali salts under examination act as agents both toxic and stimulating upon the growth of rice seedlings, according to their concentrations. The toxic concentrations of magnesium sulphate and chlorid, calcium chlorid, sodium chlorid and carbonate are greater than 1/100-normal while sodium sulphate and bicarbonate are greater than fiftieth-normal. The highest stimulation is observed in the dilution of 1/500-normal for magnesium sulphate, 1/1,000- to 1/5,000-normal for magnesium chlorid, 1/1,000- to 1/5,000-normal for calcium chlorid, fiftieth-normal to 1/100-normal for sodium chlorid, 1/100- to 1/500-normal for sodium carbonate and bicarbonate."

In studying the antagonism between the toxic effects of 2 salts upon the growth of rice seedlings, the results of 10 experiments that included the use of MgSO_4 , CaCl_2 , Na_2SO_4 , MgCl_2 , and NaCl , showed that "the salts under examination, used separately, are very poisonous in tenth-normal concentration upon the growth of the rice plant, but when the 2 salts are mixed with each other in a suitable proportion, the toxic effect of each salt more or less completely disappears. This result is of great importance in alkali soil investigations. The antagonistic action of salts is due to that of the ions formed by the dissociation of the salt. In general, divalent cations are markedly antagonized by monovalent cations, but on the other hand, monovalent cations do not strongly antagonize divalent cations. Among the divalent cations, calcium shows a more marked antagonism than magnesium. The antagonism between Cl' and SO_4'' , though it is small in comparison with that between cations, is also present in no slight degree."

In 14 experiments as to the antagonistic action of sodium and potassium salts, which included NaNO_3 , KCl , KNO_3 , NaCl , K_2SO_4 , and Na_2SO_4 , the results showed that "sodium and potassium salts are antagonized by each other. The curve of antagonism between these salts shows 2 maxima and the location of these maxima is almost constant, occurring at the point of the proportion of 5:25. This coincides with the result which was observed by Osterhout on wheat seedlings. The antagonism between these salts is due to cations as well as anions. The antagonism between anions is small in comparison with that between cations."

In studying the antagonism between potassium and magnesium or calcium ions, 2 experiments in which KCl , MgCl_2 , and CaCl_2 were used showed that "potassium and magnesium or calcium salts are poisonous to the rice plant when used separately but when mixed together in suitable proportion the poisonous effect more or less completely disappears. The results coincide with those of Osterhout and form an important factor in the question of soil fertility."

As to the possibility of barium and strontium replacing the antagonistic action of calcium, 2 experiments in which MgCl_2 and NaCl were used as the toxic salts, showed that "the injurious effect of certain metallic ions upon the growth of rice seedlings may be perfectly counteracted only by the presence of calcium ions. Strontium ions can exert an influence only slightly retarding the toxicity of the metallic ions. Barium ion not only has no beneficial action but

a depressing effect is observed. Consequently, it is concluded that barium and strontium can not replace the antagonistic action of calcium."

Tabulated data of the results of these experiments are given in terms of length of leaf, length of root, and number of roots.

On the composition of rice of Siam, G. LIBERI (*Ann. R. Staz. Chim. Agr. Sper. Roma*, 2. ser., 6 (1913), No. 2, pp. 225-246; abs. in *Ztschr. Gesam. Getreidew.*, 6 (1914), No. 3, p. 61).—Some rices of Siam are classified into 3 types, and data on the dimensions and weights of kernels of these types are given. The lengths ranged from 4.94 to 8.58, the widths from 1.97 to 3.19, and the thicknesses from 1.42 to 2.19 mm.

Chemical analytical data are given in tabular form for about 30 samples from these types and comparison is made with Italian rice.

On the influence of variety, preceding crop, fertilizer, and stand upon the yield of rye, GERLACH (*Mitt. Kaiser Wilhelms Inst. Landw. Bromberg*, 5 (1913), No. 5, pp. 360-402).—Tabulated data give results of tests of about 12 varieties covering the years 1909-1912.

The results of a previous treatment of the soil showed fallow and lupine as a green manure to be unprofitable, except that on sandy soil lupine could be plowed under with profit. Good yields were obtained on clover sod, but the rye was more frequently damaged by pests. Good results were obtained after barley and oats, after an application of commercial fertilizers, and after early potatoes. It is noted that the best results were obtained when the rotation was such that the same crop did not always precede the rye. The small demands of the young rye plant made a supply of nitrogen-furnishing fertilizer in the fall unnecessary, but a spring application of nitrate of soda proved remunerative. Seeding at the rate of 120 kg. per hectare (107 lbs. per acre) with drill rows 12 to 15 cm. (4.7 to 5.9 in.) apart gave good returns.

Soy beans in South Africa, E. W. THOMPSON (*Daily Cons. and Trade Rpts. [U. S.]*, 16 (1913), No. 273, p. 955).—This notes the trial of over 80 varieties of soy beans at the government experimental farms in South Africa, some yielding 2,000 lbs. of beans and from 12 to 13 tons of green fodder per acre. It is noted that altitude seems to affect the yield of oil, as beans grown at an altitude of 3,354 ft. contained 20.65 per cent. at 500 ft. 21.36 per cent, and at 49 ft. 22.19 per cent of oil.

A seven-year variety test with stock beets, 1904-1910, G. BÖHMER (*Arb. Deut. Landw. Gesell.*, No. 243 (1913), pp. VIII+357).—This report gives data on growth, total yield, yield of leaves, yield of dry matter in leaves and roots, and percentage of sugar in tests carried on throughout Germany under the direction of the German Agricultural Society.

Will annual comparison of the quality of sugar-beet seeds give desired results? J. URBAN (*Ztschr. Zuckerindus. Böhmen*, 37 (1913), No. 9, pp. 444-448).—From a 2-year test the author concludes that all beet seeds maintain their relative quality in different years, this depending upon the inherited tendency of the respective seed. In other words, a beet seed with the inherited tendency to produce beets high in sugar will show this property in different fields and in all seasons.

On the influence of flowers of sulphur on the growth of sugar beets, J. URBAN (*Ztschr. Zuckerindus. Böhmen*, 37 (1913), No. 9, pp. 441-444).—This article gives a review of investigations along this line. The results obtained by the author in applying flowers of sulphur at the rate of 200 kg. per hectare (178 lbs. per acre) immediately after planting sugar-beet seed showed a slightly increased total yield, but no differences were observed in the color of the leaves during growth, in the sugar content of the beets, or in the quality of the juice.

Seedling canes and manurial experiments, J. P. D'ALBUQUERQUE ET AL. (*Local Dept. Agr. Barbados, Seedling Canes and Manurial Expts., 1911-1913, pp. 77*).—In this report methods of hybridizing sugar-cane plants and of obtaining self-fertilized seeds are described. Tables give results of variety tests of new seedlings and ratoons, with a summary of results since 1909. In manurial experiments, the results obtained by the use of barnyard manure, sulphate of ammonia, nitrate of soda, dried blood, superphosphate, basic slag, sulphate of potash, nitrate of lime, and nitrolime as fertilizers for sugar cane are given in tabular form for 1911-1913, as well as the average results obtained on the manurial experiment plats at Dodds for 20 years, 1894-1913. In these experiments nitrogen was applied at the rate of 60 lbs., potash 60 lbs., and phosphate 80 lbs. per acre each year.

The results showed that "where 60 lbs. of nitrogen as sulphate of ammonia was applied, 15 lbs. in January and 45 lbs. in June, there has been only a small gain over the 'no-manure' plat of \$2.74 and a loss compared with the 'no-nitrogen' plat of 70 cts. per acre per annum. Where 80 lbs. of nitrogen as sulphate of ammonia was applied, there has been a gain of only \$3.10 over the 'no-manure' plat and a loss when compared with the 'no-nitrogen' plat of 34 cts. per acre per annum for that period.

"With regard to the phosphate series, it is sufficient to say that in all the plats to which phosphates have been applied during the 20 years there has been a loss as compared with the 'no-phosphate' plats, with the exception of the plat to which 100 lbs. of basic slag has been applied per acre. In this case there was a gain of \$18.84 over the 'no-manure' plat and \$1.96 over the 'no-phosphate' plat. In the case of the 'no-phosphate' plat the gain over the 'no-manure' plat was \$16.88. With regard to the plats to which superphosphates were applied, the loss on the average per acre per annum for the 20 years varied from \$14.13 to \$6.18. In the case where 80 lbs. of basic slag was applied, the loss on the average for the 20 years was \$1.78 when compared with the 'no-phosphate' plat.

"In the potash series of all the plats, with the exception of the one to which 60 lbs. of potash as sulphate of potash was applied all in January there was an increase varying in the case of the 'no-manure' plat from \$2.75 to \$9.94 and in the case of the 'no-potash' plat from 56 cts. to \$5.13 per annum. In the case of the plat to which potash at the rate of 60 lbs. per acre was applied there was a gain of only \$2.75 over the 'no-manure' plat and a loss of \$2.06 when compared with the 'no-potash' plat."

Studies on the tobacco crop of Connecticut, E. H. JENKINS (*Connecticut State Sta. Bul. 180 (1914), pp. 3-65, pl. 1, figs. 14*).—"This bulletin is in no way a guide to tobacco growing or a treatise on the whole subject but simply brings together in small compass the general results of such work as this station has done in the interest of tobacco growers and handlers," and covers a period of perhaps 20 years. It was necessitated because of the exhaustion of the station's previous bulletins and reports on the subject.

The topics handled in this bulletin include quantity of nitrogen and mineral elements in the tobacco crop (leaves, stalks, total); relation between composition of ash and the burning quality; proximate composition of the leaf before and after fermentation; grain of tobacco; area of leaf surface on an acre of tobacco; seed production of tobacco; fertilizer experiments, that include loss of weight in fermentation, weight of leaves, fire-holding capacity, percentage of wrappers, yield, loss in sorting, comparative value of leaf from several plats, and the comparisons of nitrate of soda, cotton-seed meal, castor pomace, linseed meal, fish scrap, stable manure, tobacco stems, various forms

of potash, and the use of large amounts of phosphates; shaded tobacco; curing with artificial heat; fermentation of tobacco in case; fermentation of tobacco in bulk; tobacco breeding; insects which injure tobacco; and fungus diseases.

A bibliography of publications relating to tobacco of wrapper leaf type grown in New England, containing 92 titles, is appended.

Studies upon influences affecting the protein content of wheat, G. W. SHAW (*Univ. Cal. Pubs. Agr. Sci.*, 1 (1913), No. 5, pp. 63-126).—In this publication data are given of the results obtained in studying the seasonal, varietal, and individual variations in the protein content of wheat.

These experiments cover a period from 1906 to 1912, inclusive, and have shown that "in general the physical appearance of durum and red wheats is a fair indication of their relative protein content; kernels having a distinctly horny or glutenous appearance being higher in protein than those of a more or less dull or starchy appearance. There is a wide seasonal fluctuation in protein content of wheat which may become so great as to overbalance almost entirely any hereditary tendency of starchy originals to produce the same characteristics in their progeny. The protein content of wheat in a locality is undoubtedly largely dependent upon the seasonal precipitation in such locality. The use of perfectly typical glutenous seed is invariably followed under California conditions by a lowering of the gluten content, as indicated both by the physical appearance of the grain and by its protein content. If the original carries a considerable percentage of starchy kernels the progeny usually shows an increase toward the typical character to a degree determined by the character of the season in the locality. This is especially so with reference to the precipitation, which in some instances may have such a strong influence as to cause a practically perfect grain to result from an original seed carrying 100 per cent of starchy kernels. [It is also noted that] the character of the seed used has quite a marked influence upon the progeny, and that the quality of the seed used, to some degree at least, determines the character of the resultant crop, for, as the originals decrease in both percentage of typical kernels and protein the progeny in each case decrease in the same order, although the effect of this is materially lessened and sometimes almost entirely overcome by the character of the season. . . .

"There are important seasonal, varietal, and individual variations in wheat plants with respect to protein content. The principal factor causing the most pronounced variation in the protein content of wheats is climate, particularly the moisture supply in the later growing period of the crop. The tendency of wheat kernels to change from a glutenous to a starchy condition is not a constant one, but is mainly dependent upon the individuality of the plant and upon seasonal influences, particularly moisture supply in the latter part of the growing period of the plants. In wheats 100 per cent of which are entirely starchy there may be a reversion to an entirely glutenous condition in a single season, or the reverse may occur, dependent upon the seasonal condition.

"Allowing the grain to stand on the straw in the field until fully ripe does not materially affect the protein content. The protein content of wheat is affected by the time of seeding, the product of late seeded grain having a higher percentage of protein than that of early seeded grain. The protein content of wheat is very largely influenced by the water content of the soil in the later period of its growth, and the effect of either irrigation or rainfall during this period is to lower its protein content. The percentage of sunshine which the grain receives during its period of growth has a somewhat direct bearing upon its protein content, but other seasonal conditions are more important. Retarding the growth through cooling the atmosphere has a tendency to increase the protein content. The quantity of available nitrogen in the soil either alone

or in the presence of other available plant foods, provided there be sufficient to supply normal growth, appear to have little, if any, influence upon the protein content. The low gluten content of wheats grown in California is not due to soil exhaustion, but rather to the following causes: (1) To climatic factors which allow a long growing period; (2) to relatively early seeding; (3) to the use of varieties inherently low in gluten; (4) to a lack of selecting highly glutenous seed."

On the germination of wheat treated with some fungicides and insecticides, G. PICCHIO (*Coltivatore*, 59 (1913), No. 32, pp. 435-439).—It is noted that seeds immersed for 5 minutes in copper sulphate solutions ranging from 0.5 to 1.5 per cent in strength were not injured in germination ability, but increasing the strength up to 4 per cent in 0.5 per cent degrees caused a decrease in germinative ability until it reached 10 per cent.

A 40 per cent solution of formalin had little influence on the germinative ability of the seed placed in it for an hour. Vapor of carbon bisulphid had no effect on the quality of the seed.

Caffaro paste, a proprietary fungicide consisting chiefly of copper sulphate, had a similar effect, but not so marked as the copper sulphate.

Methods of seed germination tests, H. PIEPER (*Fühling's Landw. Ztg.*, 62 (1913), No. 18, pp. 625-633).—In his endeavor to find a method that would give results in germination tests that would run parallel to field conditions, the author tested oats, wheat, white mustard, lupines, and sainfoin by methods in which the seeds were covered with 3 cm. of either quartz sand, heavy clay, brick dust, sandy loam, or humus soil. Tabulated results are given.

It is noted that the method that employed quartz sand gave the most satisfactory results, as by it not only the viability but also the vegetative strength of the seeds could be determined.

The influence of atmospheric moisture, temperature, and oxygen of the air on stored seeds, M. HEINRICH (*Landw. Vers. Stat.*, 81 (1913), No. 3-6, pp. 289-376, pls. 2).—In this experiment there were used *Agrostis alba*, *Avena elatior*, *A. sativa*, *Beta vulgaris*, *Carum carvi*, *Centaurea cyanus*, *Daucus carota*, *Hordeum vulgare*, *Linum usitatissimum*, *Sinapis alba*, *Lupinus angustifolius*, *L. luteus*, *Lolium perenne*, *Medicago lupulina*, *M. sativa*, *Ornithopus sativus*, *Phleum pratense*, *Pisum sativum*, *Secale cereale*, *Spergula arvensis*, *Triticum sativum*, *Trifolium hybridum*, *T. pratense*, and *T. repens*. In studying the factors that might influence the viability of stored seeds the author handled moist seeds placed in a ventilated moist atmosphere; moist seeds in a confined atmosphere; air-dried seeds in a ventilated room atmosphere; air-dried seeds in a dried ventilated atmosphere; and seeds in various degrees of temperature from 0° to 30° C., and for several weeks (in some cases 70 weeks) under the above-mentioned atmospheric conditions.

It was concluded from the results that seeds, although high in hygroscopic water content, will retain their viability for a longer period when fresh air is admitted to them in storage. With free access of air the viability of seeds is not prolonged by previous drying of the seeds. The viability of seeds may be greatly prolonged even in a high temperature (30°) when artificially dried—stored with air excluded. A low water content for seeds stored with air excluded is considered advisable. A low temperature (under 5°) without exception favored the viability of seeds stored for a long period even though they contained a large amount of hygroscopic moisture. The viability of old seeds succumbed to unfavorable conditions more readily than did that of fresh seeds.

Data are presented in numerous tables.

Weed exterminator (*Cal. Cult.*, 41 (1913), No. 22, p. 533).—This notes success in the use of carbon bisulphid to exterminate weeds by a method that

introduces the liquid into the soil to the depth of from 2 to 3 in. by the employment of a pointed rod. The killing of anise and morning glory is mentioned.

Polygonum (Fagopyrum) tataricum as a weed in buckwheat fields in Volhynia, K. KAMENSKY (*Trudy Bûro Prikl. Bot. (Bul. Angew. Bot.)*, 6 (1913), No. 7, pp. 496, 497).—The appearance of this weed, probably coming from Siberia, is noted.

Apparatus for taking soil samples, I. SCHEWELEW (*Trudy Bûro Prikl. Bot.* 6 (1913), No. 7, pp. 441–448, pl. 1).—This describes an apparatus for taking from definite strata of soil samples of a given depth and volume, in which the quantity of weed seeds may be determined.

HORTICULTURE.

Report of the horticulturist, J. E. HIGGINS (*Hawaii Sta. Rpt. 1913*, pp. 22–26, pls. 2).—The horticultural investigations during 1913 were continued along the lines previously noted (E. S. R., 29, p. 234).

The results of the papaya investigations up to June, 1913, are presented in the bulletin noted on page 841. Among the recent developments in the work with papayas is a disease which is quite new to the station. It appears to be characterized by a wilting of the leaves and a decay of the stem, causing the sudden and entire destruction of the tree. The disease is now being studied by Lyon and Larsen at the Hawaiian Sugar Planters' Station and every precaution is being taken to prevent its spread. In connection with the change in sex of a papaya tree, brought about at times apparently by cutting back the top of the tree as discussed in the bulletin mentioned, a number of young male trees of a lot in which the females had matured no fruit were subjected to the removal of the growing portion at the end of the stem. In several instances there appears to be a large increase in the number of hermaphrodite flowers in the inflorescence just below the wound, although many of the trees showed no change whatsoever. None became pistillate trees, and it can not be observed that the new branches bear any more hermaphrodite flowers than the original stem. A similar experiment was conducted with 15 male trees which were several years old. Seven of these were cut off about 18 in. above the soil and 8 were cut leaving a stem about 4½ ft. high. None of these have yet shown any pistillate or hermaphrodite flowers. The indications are that old trees should not be cut lower than 4 or 5 ft., since 4 of those cut low have failed to put out any shoots, whereas shoots have grown on all but one of the trees cut high.

Observations on 2 lots of pineapple seedlings, secured from a single fruit in each case, show a very wide variation, a range in vigor from very weak to very robust, in color of foliage from dark green to bronze, in habit from upright to procumbent, and from very spiny to those which are practically spineless. In order to determine whether differences in the shape of fruit among plants supposedly of the same variety are purely incidental to environmental conditions or whether they represent characters which may be transmitted by asexual propagation, plants bearing both square and tapering fruits were selected for preliminary experiments in 1910. Measurements of the fruits of the progeny of these plants gathered in 1912 indicate a probable transmission of form characters by asexual propagation. In continuation of this experiment individual plants of marked character are being selected as they are found and the fruit of the progeny from these plants is to be compared with the fruit from the parent plants.

Experiments to determine the best seasons and methods for the pruning of peach trees in the tropical climate of the lowlands in Hawaii have been con-

ducted for a number of years. The best results have been secured by practically an annual renewal of the top. This pruning is done in June very soon after the gathering of the fruit. Although the foliage is almost entirely removed the tree soon sends out many new branches which grow vigorously until winter, when they begin maturing fruit buds. All suckers that are not required to improve the shape of the tree are removed.

In connection with the top-working of seedling avocado trees the best results have been secured by cutting the trees back to stumps about $1\frac{1}{2}$ or 2 ft. high and budding the vigorous shoots rather than by budding the side branches of the original trees. Brief notes are given on the general condition of the experimental orchards. The *Pejioa sellowiana*, received from southern California in 1908, has made a satisfactory growth and fruited during the year for the first time.

The breeding investigations with ornamental hibiscus plants were continued by V. S. Holt, the important features of the work having been published in bulletin form (E. S. R., 30, p. 445).

Fertilizer experiments with tomatoes. A. L. DACY (*West Virginia Sta. Bul.* 142 (1913), pp. 3-27, figs. 6).—This bulletin reports the results of cooperative fertilizer experiments with tomatoes grown for the cannery in Morgan County, W. Va., in 1909, 1910, and 1911.

The fertilizer element most deficient in the soils included in these experiments was phosphoric acid. The tests failed to show any material difference between bone meal, basic slag, and acid phosphate as carriers of phosphoric acid. Although the effect of nitrogen was less marked it gave better net returns when used in the form of nitrate of soda either alone or in combination than when applied in the form of dried blood or cotton-seed meal. A test was made of quicklime in 1911 applied at the rate of a ton to the acre, both alone and in combination with stable manure, with a detrimental effect on the yield of the tomatoes. On the other hand, the beneficial effect of the lime was quite marked on the clover and vetch sown in the tomatoes at the last cultivation. High-grade commercial fertilizers gave better average net results with one exception than the same amounts of low-grade fertilizers. Based on the results as a whole, the author recommends the application of 400 lbs. to the acre of a commercial fertilizer containing 3 per cent nitrogen, 8 per cent available phosphoric acid, and 10 per cent potash, together with the addition of humus or organic matter to the soils by the use of stable manure and various green manures.

Hardiness of fruit buds and flowers to frost. F. GARCIA and J. W. RIGNEY (*New Mexico Sta. Bul.* 89 (1914), pp. 52, figs. 9).—The authors here report a study of the relative hardiness to frost of fruit buds and flowers at different stages of growth. In the investigation, which was conducted in the station orchard during the 5 seasons, 1909 to 1913, special attention was given to peach buds, although some data were also secured with plums, apples, pears, and apricots. In addition to the results of the above investigation, phenological data are given showing the blooming and fruiting period of 2 varieties of apricots and 7 varieties of plums for 7 years and of 6 varieties of peaches for 15 years. A record is also given of killing temperatures during March and April for the years 1892 to 1913, inclusive.

The data recorded at the station, especially for peach buds, show that the degree of resistance to frost varies with different stages of growth and that the bloom is not the most tender stage of the growth, the newly set peach being more delicate than the newly opened blossom. The peach is least resistant when it is about the size of a pea, when the calyxes are falling off. A tempera-

ture of 26° F. lasting only a short time did little or no injury to the opening bud, newly opened blossom, or newly set fruit of peach, native plum, pear, and apple, while one-half a degree below this (25½°), although lasting only a few minutes, killed a large percentage of the opening buds, newly set blossoms, and young fruit of the peaches in a number of cases. In some cases, however, a temperature of 24° lasting only a short time left about 25 per cent of the blossoms and 9 per cent of the newly set fruits uninjured. The longer the time the killing temperature remains and the nearer it is to sunrise the greater the amount of damage that should be expected. In cases where the minimum temperature occurred at midnight or a little later and then gradually rose to the freezing point so that the frozen buds, blossoms, and fruits had time to thaw out slowly before sunrise the injury was insignificant. Apples and pears seemed to be more resistant than peaches and plums. European and native plums seemed to be slightly hardier than Japanese plums and apricots. Apricots were the least resistant of all the fruits included in the test.

The susceptibility of most varieties of apricots, plums, and peaches to frost injury emphasizes the importance of choosing late blooming varieties, provided they are at least fairly satisfactory in other respects. The comparative temperatures for March and April taken in the valley and on the mesa show that the minimum temperatures were considerably warmer at the latter location.

Experiments in the dusting and spraying of apples, F. M. BLODGETT (*New York Cornell Sta. Bul. 340 (1914), pp. 149-179, pl. 1, figs. 4*).—In the experiments here reported finely ground sulphur plus lead arsenate applied both in liquid and dry form were compared with lime-sulphur-lead arsenate solution in the control of apple scab and insect pests.

The first experiments were started in 1911 but neither scab nor insects were present in sufficient quantity to secure any definite results. It was found, however, that the sulphur mixtures adhered remarkably well to the foliage and fruit and there was no indication of foliage injury or dwarfing. In 1912 a mild attack of scab was controlled about equally well by the three different treatments used. Arsenate of lead was about equally effective when applied with the lime-sulphur solution and with a suspension of sulphur. It was considerably more effective in the dry mixture than in either of the liquid mixtures. The experiments were continued on a larger scale in 1913. The details are given as to quantities of material used, dates of application and conditions influencing the same, time required, comparative costs, results, and methods of recording data.

From the data thus far secured in the investigation the author concludes that the use of finely ground sulphur as a fungicide and a dust mixture has given sufficiently encouraging results to warrant further trials on a more extensive scale. The application of arsenate of lead in powdered form in the quantities applied is more effective against the common orchard insects that chew than is the same substance applied wet. The cost of material and application of the dust mixture used in 1913 was as great or greater than the application of a wet spray. The time required for dusting an orchard is much less than that required for spraying. The opinion is advanced that the orchardist with additional acreage coming into bearing will probably be warranted in awaiting the results of another year's experimentation before buying additional spraying equipment.

Plum culture and district lists of plums suitable for Canada with descriptions of varieties, W. T. MACOUN (*Canada Expt. Farms Bul. 43, rev. ed. (1913), pp. 72, figs. 10*).—The present edition of this bulletin (E. S. R., 15, p. 476) has been revised to include the information gained from recent experience in connection with plum growing at the Central Experimental Farm.

Grafting Vinifera vineyards, F. T. BIOLETTI (*California Sta. Circ. 115 (1914), pp. 8, figs. 2*).—In the present circular the author discusses the grafting of Vinifera varieties of grapes on other varieties of the same species in distinction to the grafting of Vinifera varieties on American or phylloxera resistant stocks. Consideration is given to the choice and conservation of the scions, season of grafting, preparation of stock and scions, necessary tools, method of operation, and after treatment of grafted vines.

[Banana investigations at the Hilo substation], F. A. CLOWES (*Hawaii Sta. Rpt. 1913, pp. 50, 51*).—At the beginning of the year the cooperative station at Hilo was taken over as a substation and all experimental work discontinued except the banana experiment. This experiment was planned to study the influence of planting bananas at various distances apart. The distances used were 8 by 8, 10 by 10, 12 by 12, and 15 by 15 ft. Data secured on the first crop show that the yield increases as the planting distance decreases. It has been suggested, however, that the results of future crops may alter the standing of the various plots.

Factors governing the successful shipment of oranges from Florida, A. V. STUBENRAUCH, H. J. RAMSEY, L. S. TENNY, ET AL. (*U. S. Dept. Agr. Bul. 63 (1914), pp. 50, pls. 15, figs. 26*).—This comprises a report on harvesting, handling, and shipping experiments started during the season of 1907 and continued on a commercial scale through 5 shipping years. The work which was planned along lines similar to those followed in the California investigations (*E. S. R., 20, p. 43*) included the determination of the character and type of handling employed in the various operations of preparing fruit for shipment and the discovery of the relationship between prevailing methods and the occurrence of decay. The object of the work was to suggest changes in the industry which should reduce the immense annual financial loss of the Florida growers by enabling them to market their fruit in sound condition. The methods of handling the orange crop previous to the investigation, as well as the improvements which have been made during the course of the investigation, are described. The results of the various experiments are reported in detail and recommendations are made relative to handling the crop in order to secure the minimum of mechanical injuries.

The experiments during the past 7 years have proved conclusively, as in the California investigations, that the condition of the fruit after arrival at market depends largely upon the character of the work done in the grove and the packing house, that it is possible so to conduct the operations of picking, packing, and shipping as to inflict a minimum of mechanical injuries, and that uninjured Florida oranges can be placed on the market in practically sound condition. Even in seasons of very high decay practically all loss from blue mold decay such as has occurred in the past can be eliminated. In addition to the losses from blue mold, however, there has been considerable deterioration of Florida citrus fruits after arrival in market due to the attacks of the stem-end decay fungus. Unlike blue mold this fungus does not apparently depend upon injuries or breaks in the skin through which to gain entrance to the tissues of the fruit. An investigation during the season of 1910-11 in cooperation with the Florida Experiment Station proved conclusively that the stem-end rot disease can not be controlled by means of careful handling. The results of this investigation have been previously noted (*E. S. R., 26, p. 449*).

The papaya in Hawaii, J. E. HIGGINS and V. S. HOLT (*Hawaii Sta. Bul. 32 (1914), pp. 44, pls. 10*).—This bulletin comprises as a whole a progress report on the station's papaya cultural and breeding investigations (*E. S. R., 29, p. 234*) including a review of related literature of the subject.

In part 1, under the general heading of culture and uses, consideration is given to the natural requirements of papayas, propagation, transplanting large trees, irrigation, fertilizers, pruning in relation to change of sex, thinning the fruits, artificial feeding, renewing the plantings, the fruit crop, varieties, the papaya as a food (including recipes), medicinal and other uses, and papain, collecting the juice and preparing crude papain. Part 2 of the bulletin comprises a progress report on the work thus far accomplished in the attempt to secure improved strains of fruit by breeding. The subject matter is discussed under the following general headings: Botanical names, common names, botanical relationships, descriptions of forms of papaya, summary of forms, significance of the forms, change of sex, origin of different forms, origin of the dioecious *Carica papaya*, breeding with the dioecious forms, breeding the hermaphrodite forms, hermaphroditism in *Lychnis dioica*, breeding within the andromonoecious forms, crossing the different forms, parthenocarpy, parthenogenesis, hybridization of *Carica*, an attempt to breed a hermaphrodite papaya, and ideals in breeding the papaya. A brief note on insect pests by D. T. Fullaway is also included.

The authors here recognize 13 forms and combinations in which the papaya occurs, with reference chiefly to the distribution of sexes and the shape of the fruit. Some of these forms are not constant, whereas others are distinct and have a practical bearing upon the subject of breeding. Of these latter the most important are the male and female of the dioecious papaya together with 2 andromonoecious forms and 2 hermaphrodite forms. With reference to inconstant forms the most primary change of sex which takes place is to be observed in the appearance of hermaphrodite flowers on trees that have previously produced only staminate inflorescence. This fruiting of the male papaya takes place most freely in cool climates outside the Tropics or at high altitudes. Aside from the influence of climate on change in sex there are many references in the popular literature of the papaya to the acquiring of fruit-bearing habits by the male tree due supposedly to some injury such as removal of the terminal bud or the breaking of the roots in transplanting old male trees. Iorns reported a case of this kind in which female flowers appeared on male trees as a result of the removal of the terminal bud. He concluded, however, that other conditions than the loss of the terminal bud must be present and suggested that the trees may pass through cycles of development (E. S. R., 20, p. 444). In another authenticated instance reported by J. T. Gulick female flowers with resulting fruit developed on a male tree which had been beheaded. Since methods such as these do not bring about similar results unfailingly, the authors conclude that certain unknown conditions are present, and suggest that the phenomenon may be due to bud variation. No record has been found which would indicate that the strictly female or pistillate tree has ever changed its sex. Some of these changes in sex when they have been brought about tend to reproduce themselves in the offspring of such plants.

A study of the difficulties which are met with in using the dioecious type for breeding purposes has led the authors to work principally with the hermaphrodite forms. The results of this work thus far show that it is possible by using a hermaphrodite parent to do away with the very large proportion of male trees which usually result from dioecious seed. Seed of one hermaphrodite tree found in a Honolulu papaya orchard and producing fruit of excellent flavor was grown to the second generation. Of 343 F₂ trees old enough to exhibit sex characters 94 per cent were fruit bearing. Although it is considered probable that varied forms of flowers and fruits will appear it is hoped that it will be possible to develop a pure strain of uniform shape.

To test the possibilities of pollination among the various flowers 17 different combinations of pollen and stigma have been tried. The results which are here presented in tabular form show comparatively few of these to have been wholly unsuccessful. It is observed from the data secured that certain individuals and stocks exhibit peculiarities of their own in relation to pollination. Hence, although it appears evident that any of the forms may be crossed, the results presented here are offered merely as cumulative data.

Certain trees have been found to be capable of parthenocarpic development of fruit but no cases of parthenogenesis have been recorded. The authors here outline some of the ideals which the papaya breeder should have in mind in the search for Mendelian characters which may be combined.

Top-working seedling pecan trees, W. N. HUTT (*North Carolina Sta. Bul. 224* (1914), pp. 3-23, figs. 17).—After persistent trials of all the known methods of budding and grafting through the varying conditions of 4 successive seasons the author here recommends the use of patch budding for top-working both young and old seedling pecan trees. This method of budding has given the highest percentage of successful unions year after year. The operation is here described in detail and fully illustrated.

FORESTRY.

Trees and how they grow, G. C. NUTTALL (*London, New York, Toronto, and Melbourne, 1913*, pp. XI+184, pls. 82).—In this popular work the author describes a number of our best known north temperate climate trees, tells how each one grows, and points out various interesting aspects of the trees at different seasons of the year.

Balsam fir, R. ZON (*U. S. Dept. Agr. Bul. 55* (1914), pp. 68, pls. 2, figs. 8).—This bulletin embraces the results of a 2 seasons' study of the balsam fir throughout the whole of the tree's commercial range. Consideration is given to the distribution of the balsam fir; the forest types in which it occurs; the present stand and cut; its economic importance, especially in relation to the paper pulp industry; methods and cost of lumbering; life history of the tree; characteristics of the wood; rate of growth and yield; and proper methods of management. A brief bibliography is appended.

The investigation shows that balsam fir is found in commercial quantities in the northeastern border States from Maine to Minnesota.

Tests of Rocky Mountain woods for telephone poles, N. DEW. BETTS and A. L. HEIM (*U. S. Dept. Agr. Bul. 67* (1914), pp. 28, figs. 8).—The purpose of the tests, here reported in detail, was to compare the strength of poles of western red cedar, the present standard telephone pole, and of lodgepole pine and Engelmann spruce, and also to determine the value for pole timber of fire-killed pine and spruce in the central Rocky Mountain region. The tests were conducted by the Forest Service of this Department in cooperation with the University of Colorado.

Air-seasoned lodgepole pine poles cut from live timber in Montana were fully equal in strength to the cedar poles tested. Pine and spruce poles cut from a fire-killed area in Colorado were inferior to cedar poles in maximum load developed, but the 3 woods were practically the same for stresses up to the elastic limit. The fire-killed pine after standing 10 years did not show deterioration to any appreciable extent when compared with seasoned lodgepole pine cut from representative live trees in Wyoming and Colorado. The ratio between the strength of the poles and the strength of the clear material cut from them is not constant for the different kinds of wood. The values were

highest for the cedar and lowest for the spruce, the pine representing an average for the 3 species.

Tyloses: Their occurrence and practical significance in some American woods, ELOISE GERRY (*U. S. Dept. Agr., Jour. Agr. Research*, 1 (1914), No. 6, pp. 445-470, pls. 8).—The author briefly discusses the causes leading to the formation of tyloses and their function in the living plant, and reports a study of the occurrence and significance of tyloses in wood from trees of commercial size grown in the United States, 139 species having been examined. A bibliography of cited literature is included.

Tyloses were found in the sapwood of all the species where their presence was established in the heartwood. Well-developed tyloses were found in the outermost rings near the bark in 30 species of hardwoods. True tyloses were found to occur in the wood tracheids in certain pines, principally in the white pine group. Epithelial cells were found sometimes to effect a partial or even a complete tylose-like closing of the resin canals in *Pinus*, *Larix*, *Picea*, and *Pseudotsuga*. Tyloses are said to act like a natural filler in hardwoods, and woods where they occur abundantly are as a rule very durable. They reduce the penetrance of woods because they are impermeable to air, water, and creosote, thus decreasing, for instance, the tendency for woods to become water-logged. The closing of the vessels of hardwood by tyloses does not prevent the penetrance of preservatives, such as creosote, into the other wood elements.

Tyloses: A study of their occurrence and practical significance in some American woods, ELOISE GERRY (*Abs. in Science*, n. ser., 39 (1914), No. 998, p. 262).—The more important results secured in the investigations noted above are here summarized.

The selection system in forest economy, A. KUBELKA (*Internat. Inst. Agr. [Rome]*, *Mo. Bul. Agr. Intel. and Plant Diseases*, 4 (1913), No. 11, pp. 1688-1695).—A discussion of the advantages and disadvantages of the selection forest as compared with even-aged stands grown under open conditions.

The present conditions of forestry in Italy, L. PICCIOLI (*Internat. Inst. Agr. [Rome]*, *Mo. Bul. Agr. Intel. and Plant Diseases*, 4 (1913), No. 11, pp. 1682-1688).—The author here briefly reviews the evolution of forest laws in Italy in order to give an idea of the present forest conditions and the difficulties which are encountered in framing a single code of forest legislation without prejudice to the interests and customs of the population.

A bibliography of recent literature on the subject is appended.

Progress report of forest administration in Baluchistan for 1912-13, MULRAJ (*Rpt. Forest Admin. Baluchistan, 1912-13*, pp. 3+28).—A progress report of the administration of the state forests in Baluchistan, including a financial statement for the year ended June 30, 1913. The important data relative to forest areas, forest surveys, working plans, revenues and expenditures, etc., are appended in tabular form.

The lumber industry.—I, Standing timber (*U. S. Dept. Com. and Labor, Rpt. Comr. Corporations on Lumber Indus.*, pt. 1 (1913), pp. XXIII+301, pls. 2).—This comprises the first part of a statistical survey of the lumber industry of the United States which was undertaken by the Bureau of Corporations of the Department of Commerce and Labor in response to certain resolutions of Congress which called, in substance, for information on the causes of the high prices of lumber and whether or not these high prices have resulted from any contract, agreement, or combination in restraint of commerce. The present part discusses the importance of the lumber industry, the scope of the report and special principles involved, methods followed in the investigation, and the investigation area. The succeeding chapters deal with the supply of stand-

ing timber in the United States, concentration of timber ownership, acreage of timber holdings, value of standing timber, and the public land policy as a primary cause of concentration of timber ownership.

The foremost facts shown are the concentration of a dominating control of our standing timber in a comparatively few enormous holdings, steadily tending toward a central control of the lumber industry; vast speculative purchase and holding of timber land far in advance of any use thereof; and an enormous increase in the value of this diminishing natural resource, with great profits to its owners.

The lumber industry (*U. S. Senate, 61. Cong., 3. Sess., Doc. 818 (1911), pp. 38, pl. 1*).—A summary of the above report.

Forest products (*Bur. of the Census [U. S.], Forest Products, 1913, Nos. 1, pp. 10, fig. 1; 2, pp. 45; 3, pp. 10; 4, pp. 4; 5, pp. 8; 6, pp. 12; 7, pp. 6; 8, pp. 8; 9, pp. 8*).—A series of pamphlets compiled by the Bureau of the Census in cooperation with the Forest Service of this Department, and consisting of a statistical review for 1911 of the production, consumption, imports, and exports of the following forest products, arranged in order to correspond to the pamphlet numbers above: Pulpwood; lumber, lath, and shingles; slack cooperage stock; excelsior; veneers; tight cooperage stock; wood for distillation; cross-ties, including preservative treatments; and poles, including preservative treatments.

DISEASES OF PLANTS.

Proceedings under the destructive insects and pests act, 1877 and 1907, and the board of agriculture act, 1889, A. G. L. ROGERS (*Bd. Agr. and Fisheries [London], Ann. Rpt. Hort. Branch, 1912-13, pp. 57, maps 8*).—Accounts are given of the occurrence, distribution, methods of control, etc., of the gooseberry mildew (*Spharotheca mors-uvæ*), the wart disease of potatoes (*Synchytrium endobioticum*), tomato and cucumber canker (*Mycosphaerella citrullina*), the larch sawfly (*Lygæonematus erichsonii*), vine louse (*Phylloxera vastatrix*), and Mediterranean fruit fly (*Ceratitis capitata*), pests that are scheduled under the destructive insect and pest acts, and on the silver leaf disease and some other minor pests which are not scheduled.

Annual report on mycology, E. J. BUTLER (*Ann. Rpt. Bd. Sci. Advice India, 1911-12, pp. 124-127*).—The work carried on is briefly discussed and includes investigations of some sugar cane diseases, the occurrence of *Rhizoctonia* on cotton, peanuts, jute, cowpeas, potatoes, etc., and a disease of taro caused by *Phytophthora colocasiæ*. In addition brief accounts are given of studies on the grapevine mildew caused by *Oidium tuckeri*, the methods of control of the pink disease of Hevea caused by *Corticium salmonicolor*, and a rust of castor beans due to *Melampsorella ricini*.

Report on mycology, E. J. BUTLER (*Ann. Rpt. Bd. Sci. Advice India, 1912-13, pp. 116-122*).—An account is given of the chief diseases of plants investigated during the year. These include studies on the ufra disease caused by nematodes, the smut due to *Tilletia horrida*, false smut caused by *Ustilaginoidea virens*, and a disease due to *Sclerotium oryzae*. The rice diseases have been noted at length elsewhere (*E. S. R.*, 30, p. 244).

In addition to the above, notes are given on root rot of various crops due to a species of *Rhizoctonia*, sugar cane diseases, wheat rust in which it is stated that *Puccinia tritici* and *P. graminis* are the most important species of rust in India, an anthracnose of sisal hemp due to *Colletotrichum agaves*, cereal downy mildews in which it is demonstrated that in India these diseases are due to a species of *Sclerospora*, bud rot of palms, some tea diseases, etc.

The control of damping-off disease in plant beds, J. JOHNSON (*Wisconsin Sta. Research Bul. 31* (1914), pp. 29-61, pls. 2, figs. 7).—An investigation is reported on the cause of damping-off of seedlings in plant beds and methods for the control of this trouble. In Wisconsin the disease is commonly caused by *Pythium debaryanum* and a species of *Rhizoctonia*. These fungi attack a large variety of plants and their development is favored by excessive moisture and high temperatures.

For preventing attacks of these fungi a number of chemical agents have been tested, among them formalin, copper sulphate, ammonium copper carbonate, copper acetate, copper nitrate, Bordeaux mixture, lime sulphur mixture, potassium sulphid, sulphuric acid, potassium permanganate, mercuric chlorid, potassium nitrate, and iron sulphate. Of the chemicals tested a solution of formalin 1 part to 50 of water at the rate of 2 qt. per square foot of soil will prevent damping-off under the most favorable conditions for fungus growth. It was also found somewhat beneficial in stimulating plant growth and killing weed seeds. Sterilization of soil by heat gave the most satisfactory results and the inverted pan method is recommended where facilities are at hand for its application. Attention is called to the secondary effects of soil sterilization in that weed seeds and insect pests are killed and the vigor of plant growth is stimulated.

As a cultural means of control of this disease, growers are recommended to avoid infected, poorly drained soils and thick sowing of seed. Where the disease is present the covers of the plant beds should be removed so as to reduce the temperature and moisture of the soil as well as that of the air in contact with the plants. A list of the literature cited is appended.

The relation of *Fusarium nivale* to *Nectria graminicola*, J. WEESE (*Ztschr. Gärungsphysiol.*, 2 (1913), No. 4, pp. 290-302).—Reporting a study of *F. nivale*, claimed by Ihssen (E. S. R., 23, p. 545) to be a stage of *N. graminicola*, the author states that these two fungi are not identical.

A study of some imperfect fungi isolated from wheat, oat, and barley plants, E. C. JOHNSON (*U. S. Dept. Agr., Jour. Agr. Research*, 1 (1914), No. 6, pp. 475-490, pls. 2).—Attention is called to the fact that many imperfect fungi are parasitic on cereals wherever climatic conditions favor their development. A study was made of some of these fungi occurring on wheat, oats, and barley, and pure cultures were obtained of *Fusarium culmorum*, *Helminthosporium gramineum*, *Cladosporium gramineum*, and a species of *Alternaria*, and after profuse sporulation had been induced tests were made of their pathogenicity on the leaves, seeds, and seedlings of wheat, oats, barley, and rye.

Inoculation experiments in the greenhouse showed that certain species greatly reduced the germination and development of the plants. The root development of wheat plants attacked by *Helminthosporium* was stunted and the roots were markedly inferior to those developed on plants grown from clean seed. An experiment on soil infection showed that this was a possible means by which the *Helminthosporium* attacked the cereal, and the experiment indicated that the soil remained infected for at least two months, during which the experiment was in progress. Field experiments with these fungi substantiated the results obtained in the greenhouse, although the reduction in germination and injury to seedlings was somewhat less in the field experiments.

The author concludes from his experiments that *H. gramineum* and *F. culmorum* were parasitic, while *C. gramineum* and the undetermined species of *Alternaria* were not parasitic under the conditions of his investigations.

A brief bibliography is given.

The culture of cereal rusts in the greenhouse, F. D. FROMME (*Bul. Torrey Bot. Club*, 40 (1913), No. 9, pp. 501-521).—The author describes experiments by

which he was able to propagate the uredo stage of rusts in the greenhouse for several months. The species experimented upon were *Puccinia dispersa* and *P. coronifera*. These were carried through 37 generations of the uredo stage.

P. coronifera was found not to self-propagate to any extent, even when abundant host material was present and a constant humidity of 93 per cent was maintained. This high humidity was found essential in securing inoculations with uredospores of this species. The total exclusion of light either early or late in the incubation period of the fungus affected its development and resulted in an almost complete cessation of growth. The uredospores of *P. coronifera*, when stored at room temperatures, were found to lose their capacity for germination gradually, only 0.2 per cent germinating after a storage of 84 days.

A bibliography is appended.

Report of 1908-1912 studies on celery diseases in Hamburg lowlands, II. KLEBAHN (*Jahrb. Hamburg. Wiss. Anst.*, 30 (1912), *Beihft* 3, pp. 1-57, pls. 2).—These investigations are said to have confirmed previous conclusions (E. S. R., 22, p. 746) regarding the agency of *Septoria apii* and *Phoma apicola* in producing respectively leaf spot and scab of celery. It is claimed to have been shown that seed often carry fruiting bodies of *S. apii*, also that the spores live through the winter on plant rubbish in large numbers. Scab is also said to be transmitted through the seed and plant waste, but very slightly by means of air currents.

Directions are given for the manufacture and employment of a number of fungicides recommended.

Diseases of the potato tuber and the selection of sound seed, R. W. JACK (*Rhodesia Agr. Jour.*, 11 (1914), No. 3, pp. 399-407, pls. 5).—The author briefly describes scab due to *Oospora scabies*, corky scab caused by *Spongospora scabies*, Rhizoctonia stem rot, dry or white rot due to *Fusarium solani*, bacteriosis or wet rot due to *Bacillus solanacearum*, nematode disease, etc.

For the prevention of these different diseases the choice of seed from uninfected regions is advised, and where suspected seed is obtained treating the tubers with formalin or corrosive sublimate solutions is recommended.

The perennial mycelium of *Phytophthora infestans*, I. E. MELHUS (*Centbl. Bakt. [etc.]*, 2. Abt., 39 (1913), No. 18-19, pp. 482-488, figs. 2).—It is claimed to have been shown in the experiments here described that the mycelium of *P. infestans* may spread from the tuber into the young shoots, developing in the portions above ground and producing aerial spores which may become the source of secondary infections. A detailed account of the author's experiments is to be published in a later contribution.

Spraying of potato crop, C. McDONALD and R. MCKENZIE (*North of Scot. Col. Agr. Expt. Leaflet* 29 (1913), pp. 118-122).—It is claimed, as the result of an analysis of the figures obtained in 53 trials, that there was an average increase on sprayed plats of 4,000 lbs. of sound tubers per acre, the quality also showing improvement. A few cases in which there was little or no improvement are explained by heavy rainfall just after spraying or by too great delay in its employment.

A disease of spinach, P. PASSY (*Jour. Soc. Nat. Hort. France*, 4. ser., 15 (1914), Feb., pp. 106, 107).—A brief account is given of a disease of spinach which is thought to be of bacterial origin. The infected plants lose their green color, turning yellow. Later the leaves become partially destroyed, the disease beginning in the petiole, which is destroyed, and eventually the plant dies. Preliminary investigations have shown that the trouble is confined to the aerial parts of the plants, the roots retaining their normal appearance.

A leaf curl of tobacco in Kamerun, K. LUDWIGS (*Ber. Deut. Bot. Gesell.*, 31 (1913), No. 9, pp. 536-543, figs. 4).—A leaf curl of tobacco is discussed which is ascribed to abnormal nutrition resulting from a disproportionate water supply. A similar abnormality is said to have been noted in other plants and it is thought likely that still others may be affected in the same way.

Finger-and-toe experiments, A. MANSON (*North of Scot. Col. Agr. Expt. Leaflet 24* (1913), pp. 24, 25).—This report states that where infection was abundant and in the soil only, early preparation of the land for turnips reduced the disease considerably, but that where the infected manure was applied to the surface in autumn, little difference was noted. Aeration and insolation are thought to be important factors in destruction of the infection.

Finger-and-toe, A. PARDY (*North of Scot. Col. Agr. Expt. Leaflet 25* (1913), p. 52).—The results of the experiments were obscured by a rotting of the turnips due to frosts, but the cheap fungicides and other materials applied to the manure exposed in the drill appeared to have some good results where used in liquid form. Chlorid of lime showed good results. Limewater showed better results than lime, and copper sulphate and soluble alkalis showed some slight influence.

Manuring and variety tests with turnips for finger-and-toe disease, A. T. FOWLIE (*North of Scot. Col. Agr. Expt. Leaflet 28* (1913), p. 102).—Plats dressed with freshly slaked shell lime showed much less finger-and-toe disease than those dressed with an equal quantity of ground lime or limestone, which still showed improvement over the untreated portion. Two varieties of turnip seed were tested for alleged immunity. Both withstood disease better than local seed and gave a satisfactory increase of crops.

Scab disease of apples, E. WALLACE (*New York Cornell Sta. Bul. 335* (1913), pp. 541-624, pls. 11, figs. 4).—The author describes the disease of apples due to *Fusicladium dendriticum*, the conidial stage of *Venturia inaequalis*, describing symptoms, importance, etiology, and methods of control.

This disease, which is generally known as scab in the United States, is also called black spot, scurf, and sometimes rust where it occurs on the leaves and fruit. The life history of the fungus is discussed at length and the author claims that early infection is chiefly, if not entirely, from ascospores. The period of incubation may vary from 8 to 15 days, although as the first crop of ascospores is not all matured and discharged at the same time the source of infection is practically constant. The earliest infections usually occur on the lower side of the leaves. Some differences in varietal susceptibility have been reported by the author in common with other investigators, and it is found that certain varieties may be resistant one year and very susceptible the next under conditions which are apparently as favorable one year as the other.

For the control of the disease various fungicides have been tested and both lime sulphur and Bordeaux mixture have been found efficient if properly applied. Lime sulphur is preferred as usually there is less russetting of the fruit than is the case where Bordeaux mixture is used. The effect of spraying trees while dormant has been tested and two seasons' work did not materially reduce the amount of scab. Spraying fallen leaves is apparently without benefit, as the spores are protected from the fungicide until after their discharge takes place. The effect of continued spraying year after year is believed to be cumulative, although the author does not report any experiments of his own to confirm this.

The bulletin concludes with an extensive bibliography.

The yellow leaf disease of cherry and plum in nursery stock, V. B. STEWART (*New York Cornell Sta. Circ. 21* (1914), pp. 10, figs. 9).—A brief description

is given of the leaf blight, commonly known also as yellow leaf or shot-hole, of plums and cherries, due to *Cylindrosporium padi*, which is said to attack not only the sweet cherry, but some of the wild cherries, and is quite common on sour cherries and certain varieties of plums.

Symptoms of the disease and methods of control are discussed at length. It is said that both Bordeaux mixture and lime-sulphur solution may be used for the control of this disease. A 5:5:50 solution of Bordeaux mixture or a lime-sulphur solution at a strength of 1 gal. to 50 gal. of water are recommended. The addition of granulated iron sulphate to the solution is said to prevent the danger from burning and also to increase the sticking qualities of the solution.

Diseases of young grapevines, L. RAVAZ (*Prog. Agr. et Vit. (Ed. l'Est-Centre)*, 35 (1914), No. 1, pp. 3-6, pl. 1, figs. 4).—This is mainly a brief review of recent work and conclusions by several investigators named, most of whose contributions have already been noted.

Recent observations on *Stilbum flavidum* (*Agron. Colon.*, 1 (1913), No. 6, pp. 179-181).—This is a brief note regarding the report by Maublanc and Rangel, previously noted (*E. S. R.*, 30, p. 652).

[Notes on tea diseases], A. C. TUNSTALL (*Indian Tea Assoc., Sci. Dept. Quart. Jour.*, No. 3 (1912), pp. 79, 80).—The author reports that the principal tea blights noted on a recent tour in northern Terai were red rust and a root disease caused by *Ustilina zonata* (a formula for treatment for the latter being given). Blister blight on two kinds of jungle plants has been shown to be capable of infecting tea, but attempts to inoculate the former hosts with spores from the latter have not been successful. Investigations regarding the possibility and conditions of spore survival during winter are in progress.

Leaf roll and starch storing in *Syringa*, R. LAUBERT (*Gartenflora*, 63 (1914), No. 1, pp. 9-11, fig. 1).—The author describes an abnormality of lilac leaves characterized by paleness of the outer portions, rolling and stiffening in mid-summer or earlier, followed by their death and fall in July or later. No pathogenic organisms were found, but tests showed abundant presence of starch in the discolored portions. The trouble is thought to be of physiological character, possibly due to unfavorable culture methods.

Immunity in plants, H. ORDNUNG (*Mitt. Deut. Dendrol. Gesell.*, No. 22 (1913), pp. 172-176).—The author discusses the occurrence of the oak mildew (*Microsphaera quercina*), the white pine blight (*Cronartium ribicola*), and other parasitic diseases of forest trees, calling attention to their destructive occurrence in some localities upon certain species or varieties, while other host plants are more or less immune to attack. In the case of some of the species he thinks the extension of industrial works has, through their smoke, weakened the trees and made them more subject to fungus attacks, which are said to be always most severe on the first appearance of a fungus in epidemic form. Later, by acquired immunity through the elimination of the weaker individuals, a considerable degree of resistance is produced.

An investigation on the methods of propagation of mistletoe and the injury caused by that parasite (*Bul. Mens. Off. Renseig. Agr. [Paris]*, 13 (1914), No. 2, pp. 132-181).—The results are given of an inquiry made of the directors of agriculture and foresters of different departments and conservation areas of France regarding the host plants, distribution, effect, etc., of mistletoe.

According to the reports, it is found very rarely on the oak, somewhat more frequently on maple, beech, alder, etc., and quite commonly on some of the species of *Populus* and on certain fruit trees. The nature of the soil in which the host is growing does not appear to influence its occurrence and it is seldom

found growing at elevations of more than 1,000 meters. Nearly all responses attribute its distribution mainly to birds, and particularly to thrushes and other migratory birds.

Nodules on Hevea rubber trees, R. D. ANSTEAD (*Planters' Chron.*, 9 (1914), No. 2, pp. 14, 15).—This paper contains information compiled from several sources.

It is said that no connection has been proved between the bark nodules described as noted on Hevea and attacks by any insect or fungus. The nodules are known to occur before tapping, but they are seen much more frequently afterwards. Overtapping, high elevation, dry weather, and in general, conditions that tend to reduce the vitality of the trees are mentioned as factors in the production of burs and nodules.

Disease of Para rubber trees, W. R. RUTTER (*Ann. Rpt. Bot., Forestry and Sci. Dept. Uganda*, 1913, pp. 5, 6).—A description is given of an attack of *Fomes semitostus* on Para rubber trees in the garden connected with this institution. The disease is thought to be introduced in the rubber plantations through the ground not being properly cleared of decaying timber and stumps previous to the planting out of the rubber seedlings.

Dry rot investigations, A. MÖLLER (*Hausschwammforschungen*, VII. Jena, 1913, pp. V+20).—This contribution by the editor of the series reported by Falck et al. (E. S. R., 28, pp. 750, 751) gives a systematic summary of the commission's findings since the beginning of its work in 1905, regarding the biological, practical, and legal aspects of timber dry rot associated with *Merulius lacrymans* and related fungi, with references to publications previously issued.

Dry rot in factory timbers, F. J. HOXIE (*Boston*, 1913, pp. 34, figs. 19).—In a report to the inspection department of the Associated Factory and Mutual Fire Insurance Companies the author gives the results of an investigation of 15 or 20 cases involving a study of several thousand beams affected by dry rot. It is claimed that the present supply of timber available for mill construction is subject to danger, the neglect of which is resulting in serious consequences. The author's study was made of hard pine timber such as is used for heavy mill frames.

The principal injury is caused by the fungi *Merulius lacrymans* and *Coniophora cerebella*, although another species was sometimes met with. The author found that the percentage of resin in hard pine can be taken as an index of its power of resistance to dry rot. Hard pine timber 12 in. square or larger is practically unobtainable with sufficient natural resistance to withstand action of fungi in moist atmospheres. The nonresinous, sappy hard pine is said to be not safe for use for the important parts of a building without antiseptic treatment. Holes through columns, narrow spaces between beams, and hollows between floors and roofs are of no value in preventing dry rot and serve to spread it rapidly to all susceptible material. Heating a new building to 115° F. for 24 hours or more several times has been found valuable in preventing serious loss from dry rot.

Of the various antiseptic treatments in practical use, corrosive sublimate appears to be the best adapted to the treatment of mill timber. Some modification of the present process is believed necessary when deeper penetration of the antiseptic is required.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Catalogue of the mammals of western Europe (Europe exclusive of Russia) in the collection of the British Museum, G. S. MILLER (*London*, 1912, pp. XV+1019, figs. 213; rev. in *Science*, n. ser., 38 (1913), No. 970, pp. 159-

162).—This catalogue lists and describes 314 recognized forms representing 69 genera.

The review is by J. A. Allen.

The fauna of the German colonies, G. AULMANN (*Fauna Deut. Kolon. [Berlin Zool. Mus.]*, 5. ser., No. 5 (1913), pp. IV+126, figs. 99).—This fifth part of the work, previously noted (E. S. R., 29, p. 653), deals with the enemies of rubber plants.

Relative efficiency of rat traps.—Type of trap which has proved most effective in Manila, V. G. HEISER (*Pub. Health Rpts. [U. S.]*, 29 (1914), No. 6, pp. 341, 342).—It appears that the spring trap is far more economical as well as more effective than the cage trap.

The birds of North and Middle America, R. RIDGWAY (*U. S. Nat. Mus. Bul.* 50, pt. 6 (1914), pp. XX+882, pls. 36).—This sixth part of the work previously noted (E. S. R., 26, p. 346) deals with the families Picidae, Capitonidae, Ramphastidae, Bucconidae, Galbulidae, Alcedinidae, Todidae, Momotidae, Caprimulgidae, Nyctibiidae, Tytonidae, and Bubonidae, which include the woodpeckers, kingfishers, barn owls, eared owls, etc.

The bobolink (*Dolichonyx oryzivorus*) as a conveyer of Mollusca, C. T. RAMSDEN (*Auk*, 31 (1914), No. 2, p. 250).—Live mollusks (*Succinea riisci*), known from the islands of St. Croix and Porto Rico but not from Cuba, are reported to have been found among the feathers of several male bobolinks captured at Guantanamo, Cuba, on April 18, 1913.

An unusual observation on the crow (*Corvus brachyrhynchos*) at Lubec, Maine, C. H. CLARK (*Auk*, 31 (1914), No. 2, pp. 248, 249).—The author reports having observed a flock of crows capture and feed upon the body of what appeared to be a sanderling.

A new bacillus isolated during an epidemic among frogs, F. VENULET and L. PADLEWSKI (*Centbl. Bakt. [etc.]*, 1. Abt., Orig., 71 (1913), No. 5-7, pp. 343-348, pl. 1; abs. in *Jour. Roy. Micros. Soc. [London]*, No. 1 (1914), p. 68).—An epizootic disease among frogs associated with edema, more particularly of the extremities, and great weakness is said to have been due to *Bacillus septicaemiae ranarum* n. sp. "The bacillus is a slender Gram-negative rod, possessing one flagellum, motile, and not forming spores. It is pathogenic for certain fishes, crabs, guinea pigs, rabbits, and pigeons. The organism forms a toxin to which guinea pigs and rabbits are susceptible."

Handbook of entomology, edited by C. SCHRÖDER (*Handbuch der Entomologie*. Jena, 1912, vol. 1, No. 1, pp. IV+160; 1913, vol. 1, Nos. 2, pp. 161-320; 3, pp. 321-480; 4, pp. 481-528, figs. 390; vol. 3, pp. 1-112, figs. 43; rev. in *Science*, n. ser., 37 (1913), No. 962, pp. 872, 873).—Volume 1, by P. Deegener et al., of this 3-volume work deals with the anatomy, histology and morphology of the larvæ and imagoes; embryology, general morphology, metamorphosis, etc. Chapters 1 to 6 of volume 3 by A. Handlirsch take up the history of entomology, entomological literature and its use, entomological technique, classification, nomenclature, and terminology of the parts of the exoskeleton of systematic importance. Bibliographies are appended to each chapter.

Treatise on forest entomology, A. BARBEY (*Traité d'Entomologie Forestière et l'Usage des Forestiers des Reboiseurs et des Propriétaires de Bois*. Paris and Nancy, 1913, pp. XIV+624, pls. 8, figs. 367; *Ann. Sci. Agron.*, 3. ser., 6 (1911), II, Nos. 5, pp. 348-373; 6, pp. 419-439; 4. ser., 1 (1912), I, Nos. 3, pp. 181-225; 4, pp. 241-282; 6, pp. 426-459; II, Nos. 3, pp. 167-199; 4, pp. 271-298; 5, pp. 348-379; 6, pp. 420-445; 2 (1913), I, Nos. 5, pp. 379-412; II, Nos. 3, pp. 293-361; 4, pp. 420-501; 5, pp. 533-668; 6, pp. 750-797, pls. 8, figs. 367).—The first part of this work (pp. 1-24) consists largely of a discussion of insects, their

structure, classification, etc. The main part of the work gives a brief discussion of insects of general interest to the forester and then deals with the subject under the headings of 19 of the more important trees attacked. Colored plates are appended.

A text-book of medical entomology, W. S. PATTON and F. W. CRAGG (*London, Madras, and Calcutta, 1913, pp. XXXIV+768, pls. 89, figs. 3*).—The successive chapters of this work, several of which are divided into sections, take up the subject as follows: (1) Introduction (pp. 1-7); (2) anatomy and physiology of blood-sucking Diptera, general structure, and the internal structures (pp. 8-150); (3) the Orthorrhapha-Nematocera and Orthorrhapha-Brachycera (pp. 151-308); (4) the Cyclorrhapha and Pupipara (pp. 309-433); (5) the Siphonaptera or fleas (pp. 434-477); (6) the Rhynchota or bugs (pp. 478-526); (7) the Anoplura or lice (pp. 527-564); (8) the Ixodidae or ticks (pp. 565-680); (9) mites (pp. 681-697); (10) the Pentastomida and Eucepoda (pp. 698-710); (11) laboratory technique (pp. 711-728); and (12) the relation of Arthropoda to their parasites (pp. 729-745). A complete subject index is included.

A contribution to exact biology, A. HANDLIRSCH (*Sitzber. K. Akad. Wiss. [Vienna], Math. Naturw. Kl., 122 (1913), I, No. 3, pp. 361-481, figs. 5*).—The first part of this paper (pp. 362-396) deals with the relation of the metamorphosis of insects to their distribution in climatic zones.

Entomological research committee report for 1912-13 (*Colon. Rpts., Ann. [Gt. Brit.], No. 781 (1914), pp. 10*).—A report of the work of the committee since October, 1912.

[Entomological investigations in Ontario], L. CAESAR and A. W. BAKER (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm, 38 (1912), pp. 26-28*).—Black-leaf 40 when combined with lime-sulphur and applied to apple trees just before the buds burst or shortly after the aphid eggs hatched gave excellent results, almost every aphid being destroyed. It was found that spraying with lime-sulphur mixture on April 25, nearly 2 weeks before the buds burst, and in May as they were bursting both gave almost perfect results.

Injuries in a Spy orchard were found to have been caused by the young nymphs of the hemipterous species *Lygidea mendax*, *Paracalacoris colon*, and *Neurocolpus nubilus*. The damage is done by the nymphs which puncture and suck the fruit, leaves, and twigs after the blossoms fall.

A mixture consisting of 4 lbs. of arsenate of lead to 40 gal. of water sweetened with 1 gal. or more of molasses was the most effective in combating the rose chafer of any yet tested. The closely allied species *Rhagoletis fausta* was found to be associated in some districts with the cherry fruit fly in damaging Montmorency cherries.

Tests of arsenite of zinc on the codling moth and potato beetle at Guelph gave as good results as arsenate of lead.

Report of the entomologist, D. T. FULLAWAY (*Hawaii Sta. Rpt. 1913, pp. 18-21*).—This brief report of the work of the year includes a list of 60 insect forms, representing 9 orders, collected during the course of a trip to Laysan Island in December-January; a list of insects injurious to vegetables in Hawaii; and a brief discussion of the present status of work with the Mediterranean fruit fly.

The insects and other galls of plants in Europe and the Mediterranean Basin, C. HOUARD (*Les Zoocécidies des Plantes d'Europe et du Bassin de la Méditerranée. Paris, 1913, vol. 3, pp. 1249-1560, pls. 4, figs. 202*).—This supplement to the work previously noted (*E. S. R., 22, p. 657*) deals with the subject under the headings of the various plant families concerned. Bibliographical, zoological, and botanical indexes are included.

Carnivorous insects in the region of Paris, CHRÉTIEN (*Hyg. Viande et Lait*, 8 (1914), No. 3, pp. 113-129, figs. 16).—The subject is taken up under the headings of Diptera, Lepidoptera, Hymenoptera, Orthoptera, and Coleoptera.

Administrative report of the government entomologist, April 24, 1912, to March 31, 1913, T. B. FLETCHER (*Rpt. Dept. Agr. Madras, 1912-13*, pp. 36-41).—This report deals with the occurrence of the more important insect enemies and control measures.

Insect enemies of plants in Surinam, J. KUYPER (*Dept. Landb. Suriname Bul. 31* (1913), pp. 17-22, pls. 2).—These miscellaneous notes relate to injury to Hevea plants by *Dilophonota ello* and *Saissetia nigra*; to sugar cane by *Castnia licus*; to cacao by *Rutela lineola*; and to the orange by *Mytilaspis citricola*.

The occurrence of animal enemies and of diseases of the sugar beet in 1912, A. STIFT (*Bl. Zuckerrübenbau*, 20 (1913), Nos. 1, pp. 7-10; 3, pp. 39-43; 4, pp. 55-58).—This is a discussion of the occurrence of the more important pests during the year, with references to the literature.

Insect pests of truck and garden crops, 1913, A. L. LOVETT (*Oreg. Agr. Col. Bul. 91* (1913), pp. 39, figs. 13).—This is a popular account of the more important insect enemies of truck and garden crops in Oregon, with recommendations as to treatment and a discussion of insecticides.

Apple insects, W. J. SCHOENE and B. B. FULTON (*New York State Sta. Circ. 25* (1913), pp. 11, pls. 4, figs. 11).—Brief popular accounts are given of the more important apple insects occurring in New York State with the treatment therefor.

Injurious citrus insects, A. J. COOK (In *California Citrus Culture. Sacramento: State Com. Hort.*, 1913, pp. 51-82, figs. 30).—This is a summarized account of the insect enemies of citrus and means for their control.

Termites or white ants (*Agr. News [Barbados]*, 13 (1914), Nos. 309, p. 74; 310, p. 90).—Studies of material submitted to the Imperial Bureau of Entomology for examination show 10 species representing 5 genera to occur in the Lesser Antilles and 1 additional species in Porto Rico. Two of the species occurring in the Lesser Antilles were found to be new to science.

A Venezuelan reduviid (*Rhodnius prolixus*) in which *Trypanosoma cruzi* develops, E. BRUMPT and GONZALEZ-LUGO (*Bul. Soc. Path. Exot.*, 6 (1913), No. 6, pp. 382, 383).—The authors report that dejections of this hemipteran contain trypanosomes and are infective for more than 2 months after it has sucked the blood of an infected animal.

Reduviidæ of North America capable of transmitting *Trypanosoma cruzi*, E. BRUMPT (*Bul. Soc. Path. Exot.*, 7 (1914), No. 2, pp. 132, 133).—*T. cruzi* which occurs in nature in *Connorhinus megistus*, *C. infestans*, and *C. sordidus* has been found by the author, who studied a virus received from Bahia, also to develop in several species of *Cimex* (*C. lectularius*, *C. rotundatus*, and *C. boueti*) and in *Ornithodoros moubata*. Eggs from a species of *Connorhinus* received from Texas developed nymphs which were fed upon infected mice. The dejections were found to contain pure cultures of *T. cruzi* and the author thinks it probable that the infection is durable.

The tea seed bug, C. B. ANTRAM (*Indian Tea Assoc., Sci. Dept. Quart. Jour.*, No. 4 (1911), pp. 14-18, pls. 2).—The two pentatomids *Pæcilocoris latus* and *P. hardwickii* have been well known on tea estates in northeastern India but until quite recently have not been considered of economic importance. It has recently been found that the juice of both ripe and unripe tea seed is the natural food of these insects, and the evidence at hand indicates that they are responsible for a certain amount of fungus-diseased tea seed.

The wheat bug (*Ælia germari cognata*) (*Bul. Agr. Algerie et Tunisie*, 19 (1913), No. 12, pp. 257, 258, fig. 1).—This plant bug periodically invades the cereal fields of the high plateaus and is the source of considerable injury.

Contribution to the study of *Helopeltis*, C. BERNARD (*Dept. Landb. Nijv. en Handel [Dutch East Indies], Meded. Proefstat. Thee*, No. 17 (1912), pp. 1-19, pl. 1).—This is a report of studies of *Helopeltis* in the Dutch East Indies.

The avocado membracid (*Hoplophora monogramma*), J. R. INDA (*Bol. Dir. Gen. Agr. [Mexico], Rev. Agr.*, 2 (1912), No. 2, pp. 142-145, pl. 1).—This membracid is a source of considerable injury through its attack on the leaves and branches of the avocado.

On the Chermesidæ of Switzerland, N. A. CHOLODKOVSKY (*Russ. Ent. Obozr.*, 12 (1912), No. 3, pp. 597-600; *Schweiz. Ztschr. Forstw.*, 64 (1913), No. 4, pp. 114-117).—A brief discussion of the occurrence and injury of the more important species found in Switzerland, based on personal studies by the author.

The mealy bugs of California, E. O. ESSIG (*Mo. Bul. Com. Hort. Cal.*, 3 (1914), No. 3, pp. 97-143, figs. 46).—In this paper the author presents a popular account of the mealy bugs. The subject is taken up under the headings of classification, general character, life history, economic and noneconomic species, host plants, descriptions of species including food plants and distribution, natural enemies, and artificial means of control.

Woolly aphids of the elm, EDITH M. PATCH (*Maine Sta. Bul.* 220 (1913), pp. 259-298, pls. 6, figs. 19).—The author states that it has been the intention in the preparation of this bulletin and Bulletin 217, previously noted (*E. S. R.*, 30, p. 548) to bring together all available information on this group of elm aphids, as a progress report.

The species briefly noted are the woolly aphid of elm bark (*Schizoneura rileyi*), a new elm gall for America (*S. lanuginosa* ?) recently collected in Connecticut, elm rosette or leaf cluster aphid (*S. lanigera* [*americana* in part of authors]), southern elm leaf curl (*S. lanigera* [*americana* in part of authors]), northern curl of American elm (*S. americana* in part of authors), and elm currant aphid of Europe (*S. ulmi* [*fodiens*]). The notes on each species are accompanied by a bibliography.

The third part of the Food Plant Catalogue of the Aphidæ of the World (*E. S. R.*, 28, p. 60; 29, p. 654) follows (pp. 274-298).

Silkworm experiments, C. W. WOODWORTH (*California Sta. Circ.* 116 (1914), pp. 4).—This circular announces that the station is prepared to distribute silkworm eggs free of charge to anyone willing to cooperate in the effort to make silk culture profitable in California. While the growing of silk has in the past been unprofitable in this State there is said to be a possibility that the cost of production can be diminished in one way and another sufficiently to place the industry on a sound financial basis. Brief directions are given for the feeding and care of the worms.

The brown-tail moth (*Euproctis chrysorrhœa*), W. E. BRITTON (*Connecticut State Sta. Bul.* 182 (1914), pp. 3-26, figs. 16).—This is a general account of the brown-tail moth, its occurrence in Connecticut, remedial measures, etc.

The sugar-cane borer (*Diatræa saccharalis obliterallis*), A. H. ROSENFELD and T. C. BARBER (*Rev. Indus. y Agr. Tucumán*, 4 (1914), No. 6-8, pp. 233-366, pl. 1, figs. 25).—This work deals with the history and occurrence in Argentina of *D. saccharalis*, its life history, habits, natural enemies, and means of control.

A bibliography of 10 pages is appended.

Hypsopygia costalis, injurious to lucern hay in the Romagna, Italy, D. SEROZZI (*Italia Agr.*, No. 18 (1913), pp. 444-451, pl. 1; *abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases*, 4 (1913), No. 12, pp. 1928, 1929).—This moth, which has been recognized since 1902 as a source of

injury to sulla hay in central Italy, has now begun to attack alfalfa hay in the Romagna, the larvæ destroying the leaves almost completely, leaving only the stems with a few petioles. In an average attack, or when the hay does not consist entirely of alfalfa, the loss is at least 20 per cent and it may reach 50 or 60 per cent. Carbon bisulphid has not been found effective for disinfecting the hay stacks, and the author recommends that when a stack is attacked it be fed as quickly as possible to prevent the development of the larvæ.

The *Chelonia* caterpillars, F. PICARD (*Prog. Agr. et Vit. (Ed. l'Est-Centre)*, 35 (1914), No. 9, pp. 261-266, pl. 1).—This paper relates largely to *Arctia* or *Chelonia caja*, a widespread pest, and its natural enemies.

Tapinostola musculosa, a noctuid moth injurious to cereals in Hungary, J. JABLONOWSKY (*Kösztelek [Budapest]*, 23 (1913), No. 99, pp. 3335-3337, figs. 3; *abs. in Internat. Inst. Agr. [Rome]*, *Mo. Bul. Agr. Intel. and Plant Diseases*, 5 (1914), No. 2, p. 285).—This cutworm was the source of damage to oats and barley on an estate in Hungary, some 40 acres being so badly infested that the crops had to be plowed under.

The flight of the house fly, E. HINDLE (*Proc. Cambridge Phil. Soc.*, 17 (1914), No. 4, pp. 310-313).—"House flies tend to travel either against or across the wind. This direction may be directly determined by the action of the wind, or indirectly, owing to the flies being attracted by any odors it may convey from a source of food. The chief conditions favoring the dispersal of flies are fine weather and a warm temperature; the nature of the locality is another considerable factor, as in towns flies do not travel as far as in open country, this being probably due to the food and shelter afforded by the houses.

"Under experimental conditions, the height at which the flies are liberated and also the time of day influence the dispersal of the insects. When set free in the afternoon they do not scatter so well as when liberated in the morning. From our experiments the usual maximum flight in thickly housed localities seems to be about a quarter of a mile, but in one case a single fly was recovered at a distance of 770 yds. It should be noted, however, that part of this distance was across open fen land."

The cambium miner in river birch, C. T. GREENE (*U. S. Dept. Agr., Jour. Agr. Research*, 1 (1914), No. 6, pp. 471-474, pls. 2).—The dipterous species *Agromyza pruinosa*, unlike most other members of the Agromyzidæ, has the habit of mining in the cambium of the living tree, the mine leaving a scar known as a "pithray fleck." Investigations in Europe have shown that at least the pith-ray fleck in birch is caused by *A. carbonaria*, which is closely related to the species here considered. The work of *A. pruinosa* is said to be very common in river birch in the District of Columbia, every tree that was examined in one locality in 1912 containing new work. The work of the species found in wild cherry is said to be identical with that in red maple and black birch. The trees attacked are apparently healthy and infested ones can not be detected by their outward appearance, the removal of the bark and exposure of the cambium being the only way in which this can be done. Pith-ray flecks were also found in red oak (*Quercus rubra*) at Charter Oak, Pa., and in mountain holly (*Ilex monticola*) at Endeavor, Pa., but the insect or insects concerned have not been determined.

Brief descriptive accounts are given of the morphology and biology of the several stages of this miner. The egg is apparently deposited in the fork of two branches. A hymenopterous parasite, *Symphya agromyzæ* n. sp., a brief description of which by S. A. Rohwer is given in a footnote, issued from a pupa case of *A. pruinosa*. The egg of this parasite is said to be deposited within the egg of the host. The apparently normal dipterous larva mines down the tree

trunk and enters the ground; the pupa is perfectly formed, outwardly exhibiting no signs of parasitism, but about the time the host should emerge the parasite issues instead.

Some common lady beetles of Connecticut, W. E. BRITTON (*Connecticut State Sta. Bul.* 181 (1914), pp. 3-24, figs. 24).—This bulletin gives brief descriptive accounts of the lady beetles of greatest economic importance and their occurrence in Connecticut, and calls attention to their beneficial habits. There are said to be over 30 species that occur in the State. The accounts of many of the species are accompanied by illustrations.

Scydmaenus chevalieri n. sp. in Senegal, A. VUILLET (*Bul. Soc. Ent. France*, No. 9 (1913), p. 238; *abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases*, 4 (1913), No. 8, p. 1304).—This beetle is said to live on the fruit of the peanut (*Arachis hypogaea*).

A new endemic fern weevil of the genus *Heteramphus*, O. H. SWEZEY (*Proc. Hawaii. Ent. Soc.*, 2 (1913), No. 5, pp. 210, 211).—A new species of weevil is said to mine the fronds of several species of *Elaphoglossum*. A small chalcidid (*Omphale metallicus*) parasitizes the weevil pupæ.

Miscellaneous contributions to the knowledge of the weevils of the families *Attelabidæ* and *Brachyrhinidæ*, W. D. PIERCE (*Proc. U. S. Nat. Mus.*, 45 (1913), pp. 365-426).—This paper includes fixations of the types of all of the North American genera in these 2 groups and descriptions of 4 new genera, 2 new subgenera, 24 new species, and 9 new varieties.

The biology of the large brown pine beetle (*Hylobius abietis*) and remedial measures, GROHMANN (*Tharand. Forstl. Jahrb.*, 64 (1913), No. 4, pp. 325-361, figs. 3).—A detailed report of studies.

A contribution to the comparative physiology of digestion, H. PETERSEN (*Pflüger's Arch. Physiol.*, 145 (1912), No. 1, pp. 121-151, pls. 2, fig. 1).—This article relates to digestion in the honeybee.

Apiculture in British Columbia, L. HARRIS and F. D. TODD (*Brit. Columbia Dept. Agr. Bul.* 42 (1913), pp. 63, figs. 23).—This bulletin deals with modern methods of bee keeping as adapted to British Columbia, and also embodies reports of the foul brood inspectors for 1911.

A new braconid parasite of *Sinoxylon sexdentatum* in grapevine shoots, F. PICARD (*Bul. Soc. Ent. France*, No. 16 (1913), pp. 399-402, fig. 1; *abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases*, 5 (1914), No. 2, p. 280).—A new braconid parasite (*Monolexis lavagnei* n. sp.) has been found to attack the bostrychid beetle *S. sexdentatum*, which commonly destroys grapevine shoots in southern France. In addition it has been found to parasitize two oak pests, *Scobicia pustulata* and *Xyloniites praeustus*, and Corsican pine enemies of the genera *Pityogenes* and *Pityophthorus*.

On a new species of *Mymaridæ* from Trinidad, C. O. WATERHOUSE (*Bul. Ent. Research*, 4 (1913), No. 1, pp. 87, 88, fig. 1).—A description is given of *Anagrus flaveolus* n. sp., which was reared from the eggs of the corn leaf hopper, *Peregrinus (Delphax) maidis*, in Trinidad. It is closely allied to *A. frequens*, originally described from Hawaii, and *A. columbi*, from Columbus, Ohio.

Description of a new species of *Corymbites* from the Sonoran zone of Washington State, J. A. HYSLOP (*Proc. Biol. Soc. Wash.*, 27 (1914), pp. 69, 70).—It is stated that *Corymbites noxius* n. sp. was reared from larvæ which were attacking wheat in the Big Bend country of the State of Washington.

Studies on the habits and development of a hymenopterous parasite, *Spalangia muscidarum*, C. H. RICHARDSON (*Jour. Morph.*, 24 (1913), No. 4, pp. 513-557, figs. 17; *abs. in Rev. Appl. Ent.*, 2 (1914), Ser. B, No. 2, pp. 23, 24).—This article deals with the systematic relationships of the genus *Spalangia*, the geographical distribution of the genus, hosts of *Spalangia*, normal

activities of the imago, food, habits, hypermetamorphosis in the Hymenoptera, the larval types, hypermetamorphosis in *S. muscidarum*, musculature, effect of the parasite upon the host, economic importance, etc. A bibliography of 46 titles is appended.

The genus *Spalangia*, of which a list of 28 recognized species is given, is widely distributed throughout North America and Europe and a number of species have also been recorded from Central and South America and the Hawaiian Islands. Although a decided preference is shown for Diptera as hosts, their parasitism is not restricted to this order and some attack Lepidoptera, while others are myrmecophilous.

Notes on Tetrastichini, N. B. KURDJUMOV (*Russ. Ent. Obozr.*, 13 (1913), No. 2, pp. 243-256, figs. 8).—This paper includes a synoptic table of the genera of Tetrastichini and tables for the separation of species of the genera *Geniocerus*, *Aprostocetus*, and *Tetrastichus*, with descriptions of 1 species belonging to the first mentioned genus and 2 species belonging to the last mentioned as new to science.

Protozoan parasites of Ichneumonidæ, C. MORLEY (*Entomologist*, 46 (1913), No. 600, p. 169).—The ichneumonid *Stenichneumon trilineatus*, which commonly parasitizes the gooseberry moth (*Abraxas grossulariata*), has been found by Fantham and Porter (*E. S. R.*, 30, p. 459) to be attacked by 2 protozoa. One of these is a species of the genus *Nosema* to which the name *Nosema ichneumonis* has been given; the other is a flagellate belonging to the genus *Herpetomonas* to which the name *Herpetomonas ichneumonis* has been applied.

The cherry fruit sawfly (*Hoplocampa cookei*), E. O. ESSIG (*Mo. Bul. Com. Hort. Cal.*, 3 (1914), No. 1, pp. 31-35, figs. 3).—"The cherry fruit sawfly is a native of California and other Pacific coast States and has been known since 1883 in the Suisun Valley, Cal. Considerable damage to young cherries has been done in various sections by the larvæ of this insect and occasionally, at least, control measures may be necessary. The presence of the insect may be told by the small round holes bored in the young green cherries, many of which soon drop to the ground. . . . Control measures have not been thoroughly perfected but two applications of arsenate of lead at the rate of 4 to 5 lbs. to 100 gal. of water, the first application to be made shortly before the blossoms open and the second about 10 days later, have proved effective. Fall plowing is also recommended to kill the larvæ and pupæ in the soil while a distillate oil emulsion and nicotin spray is recommended to kill adults at time of egg laying.

"The insect has been reported as occurring in the Suisun Valley, Eldorado and Nevada counties, Cal., and at Medford, Oreg., where is it confined to a very small area. The orchard fruits attacked are cherry (sweet and sour), prune, plum, peach, and apricot (the peach and apricot only occasionally)."

The occurrence of a tenthredinid (*Emphytus braccatus*) on the oak, J. C. NIELSEN (*Naturw. Ztschr. Forst u. Landw.*, 11 (1913), No. 12, pp. 554-557, figs. 3).—A brief note on the occurrence of this sawfly in Denmark.

Ticks in the West Indies (*Agr. News [Barbados]*, 13 (1914), No. 310, p. 90).—This is supplementary to the paper previously noted (*E. S. R.*, 27, p. 460).

The Brazilian species of the subfamily Heterakinæ, L. TRAVASSOS (*Mem. Inst. Oswaldo Cruz*, 5 (1913), No. 3, pp. 271-318, pls. 5).—Of the 50 species of nematodes of the genus *Heterakis* listed 16 are said to occur in Brazil, 2 being described as new to science.

FOODS—HUMAN NUTRITION.

Some results of a study of the factors of bread making, ANNA W. WILLIAMS (*Jour. Home Econ.*, 6 (1914), No. 1, pp. 21-28).—The author has included

in her study the following factors: The liquid used, the yeast, the fermentation, the manipulation of the dough, and the temperature. Some of her conclusions follow:

"The amount of flour required to give a dough of a certain consistency varies according to the kind of liquid used. Water produces a finer textured, sweeter flavored, but more inelastic bread than do any of the liquids ordinarily used for mixing. But such bread dries out more rapidly than any other.

"When potato water is used the lightness and sponginess of the bread is increased to a marked degree. The use of milk, either sweet or sour, or of potato water heightens the color of the crust. The use of potato water also increases slightly the rapidity of fermentation, but the use of buttermilk increases it somewhat more. Potato water increases greatly the keeping qualities of the bread in which it is used. Milk, either sweet or sour, also increases such qualities, but to a less extent. . . .

"The volume of a loaf is influenced by the power of the yeast to act in the oven, this power being proportional to the amount of yeast. Length of time of rising in the oven is increased by an increase in amount of yeast. When a good quality of yeast is used an increase up to 2 cakes per loaf is to be recommended for shortening the time and producing better bread, although it can not be recommended from an economic standpoint. . . . Yeast, if introduced in small quantity into a sponge, will multiply until it assumes a maximum concentration, and if introduced in large quantity will cause a greater immediate production of gas, but will not give a more vigorous sponge ultimately.

"A small amount of yeast will give the same results as a larger amount if allowed a sufficient length of time in a sponge. . . .

"Fineness of texture was much more dependent upon the degree of rising allowed in the pan than upon the extent of the previous risings. Even doughs which were permitted to rise and fall in the bowl stage gave fine grain on proper treatment in the pan. . . . Underlightness in the first risings showed in the finished product in lack of mellowness and elasticity. Bread seemed better for having been allowed to reach its maximum expansion once during the process.

"Bread allowed to finish its rising in the oven is undoubtedly better in texture, although more care is required in baking to give a well shaped loaf. . . .

"A kneading stroke which was long and firm and even, covering all portions of the dough alike, and a rather quick stroke so that the dough was kept constantly in motion seemed to be the most effective sort.

"The method of molding into the loaf had also considerable effect on texture; the loaves that were not kneaded, but were molded lightly at this point, showed more plainly the effects of handling in the early stages. In all cases the formation of a compact dough, on molding into the loaf, resulted in a loaf of small volume and dull crust, but of fine and even texture; the loaf was, however, too compact, and lacked lightness and silkiness. The loaves which were lightly molded, without kneading, were superior in all points except in fineness and evenness of texture. . . .

"Overheating of the dough during rising results in a loaf of small volume, coarse texture, dark crumb, and dull, unattractive crust.

"Chilling of bread tends to lessen its volume, and to produce compactness, coarseness, and toughness of crumb.

"There is very little difference in the short process breads raised at the temperatures of 26 and 40° C. Such difference is not enough to justify the additional length of time demanded by the lower temperature.

"Doughs which are thoroughly warmed during mixing and kneading are not easily chilled afterward. . . .

"The baking temperature must be regulated according to the degree of lightness of the dough. Too hot an oven causes an underraised dough to crack after crusting over, thus producing holes in the crumb, while too cool an oven allows fairly well risen dough to become overlight. . . .

"The retention of moisture during baking, as in a covered pan or, under some conditions, in a fireless cooker increases the volume and weight of the loaf, but makes the crumb overmoist. The volume is increased because the presence of steam prevents the crusting over of the loaf, thus allowing it to rise more."

Some consideration was given to the effect of bacteria in bread making. As a result of the investigation as a whole, the author states that a score card was proposed for use in judging bread.

The staling of bread, E. VERSCHAFFELT (*Pharm. Weekbl.*, 49 (1912), Nos. 27, pp. 631-635; 52, pp. 1218, 1219; *abs. in Ztschr. Untersuch. Nahr. u. Genussmitl.*, 26 (1913), No. 11, p. 668).—The results of microscopical studies are reported.

According to the author's conclusion, stale bread shows a small but marked difference from fresh bread. When examined in water the starch grains appear distinct from the gluten. In stale bread small fissures filled with air are noticeable around the starch grains, which are absent in fresh bread. This indicates that the starch grains have shrunk in volume, a conclusion in accord with the observed fact that the absorption coefficient of the starch of stale bread is lowered.

"Lime bread" (*Pure Products*, 10 (1914), No. 1, pp. 29, 30).—The material here described was prepared under the direction of Prof. Emmerich, of Munich, and contained 20 cc. of a 10 per cent solution of crystallized calcium chlorid to every 2 lbs. of flour, the purpose of the addition being to supply the lime, which, according to Emmerich and Loew, is not supplied in sufficient amounts by ordinary bread. Foods described as poor in lime are bread, meat, and potatoes, while rice, lentils, cabbage, cherries, figs, strawberries, egg yolks, and milk are considered rich in this substance.

Report to the local government board upon the "biological properties" of milk, both of the human species, and of cows, considered in special relation to the feeding of infants, JANET E. LANE-CLAYTON (*Rpts. Local Govt. Bd. [Gt. Brit.], Pub. Health and Med. Subjs., n. ser., No. 76* (1913), pp. 95).—The ferments and so-called "protective substances" (precipitins, agglutinins, etc.) present in milk together "form the group of so-called 'biological substances' in contradistinction to the more tangible chemical substances (sugar, protein, fats, salts, and water) which constitute the directly nutritive part of milk. . . ." The aim of this report is to investigate the presence of the biological substances; to discover how far they are due to bacterial contamination, and how far they are present in milk as such, apart from the contained bacteria; further, to endeavor to determine whether such substances can be considered to be of value to the infant, in aiding, or bringing about the digestion of the food material of milk itself, or in producing immunity from the disease.

The following statements are taken from the general summary and conclusions which the author makes after an exhaustive survey of the literature of the subject and from original clinical and experimental observations: "Most of the ferments . . . are derived from the bacteria which are found in milk. There is no evidence to show that uncontaminated milk contains any ferments capable of assisting in the digestion of food by any of the processes of digestion at present known to us. The only ferments present in uncontaminated milk are those which are well known to be present in large quantities in the blood,

and ferments (whose presence is not firmly established) which act upon substances not known to occur in the processes of digestion.

"In milk, the content of ferments which are similar to those which occur in the blood is found to be increased in quantity at periods when the mammary gland is not in a condition of good working activity; such as at the beginning and end of lactation, in mastitis, and in the case of poorly acting glands.

"It is . . . universally conceded that milk from a gland in these conditions contains exudate from the blood; the healthier the gland the less the exudate. It follows, therefore, that the traces of such ferments as are found in the milk under normal conditions, are present because they have passed out from the blood either by filtration or exudation. A precisely similar explanation holds good for the presence in milk of substances concerned in the production of immunity. . . .

"The value of these materials to the infant evidently depends upon the degree of absorption which takes place from its alimentary canal. . . . It appears that absorption of protein and hence of the immune substances which are attached to the protein molecule may take place directly during the first few days of life. This capacity is, however, of very short duration, especially for foreign protein, which must be broken down before it can be absorbed.

"The oft repeated assertion of the value to the infant of raw cow's milk fades away when the facts are examined, since, in cow's milk it is found that these so-called 'biological substances' are not absorbed in the alimentary canal but are destroyed there.

"These considerations also explain the results obtained by those who have investigated the comparative nutritive properties of the raw and boiled milk of a foreign species; these results were fully summarized by me in a recent report to the local government board (E. S. R., 30, p. 760), and it was shown that in dealing with the milk of a foreign species, boiled milk gave perhaps slightly better results than raw milk. In dealing with the milk of a foreign species the real question at issue is that of the chemical changes which take place on heating. . . .

"If the milk of the same species be now considered, a somewhat different aspect is put upon the whole question, because there appears to be some degree of evidence that native protein is absorbed as such, for a longer period than foreign protein. The transitory nature of immunity procured by the suckling does not, however, lead to the supposition that this occurs to any extent, and the evidence all goes to show that the amount of protein which is absorbed as such at any time forms only a small part of the total amount present.

"The question finally resolves itself into the chemical value of the food material, and it is this fact which brings about the difference commonly observed between the condition of the average breast-fed baby and the average artificially fed infant. . . . Considering for a moment the almost certain absorption of protein during the first few days of life it would appear to be very important that the organs should receive native protein. Without entering upon the much discussed question of the effect on the infant of the introduction into the blood stream soon after birth of foreign protein, the mere fact that precipitins are formed by the organism upon the introduction of foreign protein for the express purpose of throwing these substances out of action, would of itself seem to indicate that their presence is not desirable. It has been stated that the injection of foreign protein calls forth less resistance in quite young animals than in older ones, but this probably does not mean that such substances are harmless, but that the organs are not yet sufficiently mature to be able to form precipitins. It has been shown by Schlossman and Moro that the proteins of human milk and of human blood are biologically identical, hence

the absorption of native protein brings about no disturbance to the young organism, but rather supplies it with ready-made food material, and may thus act as a stimulus to development. . . .

"The investigation of the biological properties of milk carried out in this report shows that the weight of evidence suggests the absence of any direct value in the biological substances, per se, but it also most decidedly shows the paramount importance of providing breast milk for the young animal. It would seem impossible to emphasize this fact too strongly, and all those concerned in the health of infants should aim at obtaining satisfactory breast feeding for all infants during, at any rate, the early weeks of life."

A note on the relation of different milks to infantile scurvy and beri-beri is appended, as is also an extensive bibliography.

Present knowledge regarding the putrefaction of butcher's meat, E. GRIMALDI (*Mod. Zooiatro, Parte Sci., No. 11 (1913), pp. 460-479*).—A summary of recent studies and theories concerning putrefied meats and the danger of using them for food. The importance of more careful inspection of all meat is urged on the ground that many forms of dangerous putrefaction are not recognizable by the senses.

The nitrogen content of mince-meat, C. A. A. UTT (*Amer. Food Jour., 8 (1913), No. 11, pp. 464, 465*).—On the basis of analyses of mince-meats made in the laboratory of the Kansas state food analyst, the author discusses the present federal definition of mince-meat and the recipes in common use, and suggests that the standard be so modified that instead of "not less than 10 per cent of cooked, comminuted meat", the requirement read "meat present in sufficient quantity so that the total nitrogen of the mince-meat is not less than 0.50 per cent", this nitrogen being the equivalent of about 5 per cent of meat.

Meat extracts, A. MCGILL (*Lab. Inland Rev. Dept. Canada Bul., 267 (1913), pp. 23*).—Reports of analyses of 80 samples of meat extract purchased in the open market in Canada during February and March, 1912, are here given. Of these, 12 were classified as solid meat extracts, 25 as normal meat extracts, 42 as fluid meat extracts, and 1 as meat juice.

Notes on the history of preserving fish, T. A. L. BEEL (*Ztschr. Fleisch u. Milch-hyg., 24 (1913), No. 6, pp. 129-133, figs. 3*).—A descriptive article dealing with the herring industry.

Conserving the nitrogenous material in dried codfish (*Gadus brandtii*), K. YOSHIMURA and M. KANAI (*Hoppe-Seyler's Ztschr. Physiol. Chem., 88 (1913), No. 5, pp. 346-351*).—The nitrogenous constituents identified included 13 gm. taurin, 1.4 gm. creatinin, and less than a gram of betain, methylguanidin, and alanin per kilogram of dry material. A little glutaminic acid was found but no creatin or cholin.

Investigation of reprocessed canned salmon—possible danger from its use as a food (*Amer. Food Jour., 8 (1913), No. 11, p. 462*).—This note from the laboratory of the state chemist of Washington deals with a type of canned salmon known to the trade as "do-overs." Cans processed as usual which, after a few days, show signs of swelling are frequently disposed of to brokers who puncture and reprocess them and sell the material so treated under labels which give no indication of their origin. Laboratory examination of such goods shows that the contents may or may not be rendered sterile by the reprocessing and that in some cases material already decomposed is sterilized and sold. The danger of poisoning from such reprocessed salmon is pointed out.

Dried and packaged fruit, A. MCGILL (*Lab. Inland Rev. Dept. Canada Bul. 269 (1913), pp. 25*).—This bulletin reports analyses of 175 samples of dried fruits, bought in the open market in Canada, which include raisins, currants, prunes, figs, dates, apples, apricots, peaches, and pears, 83 being obtained from

broken bulk packages and 92 from packaged fruit. Of these, 138 were found satisfactory, 20 doubtful, and 17 adulterated,

Preserves, E. COLLIN (*Ann. Falsif.*, 6 (1913), No. 62, pp. 629-638, figs. 3).—The results of microscopical studies are reported with reference to the examination of preserved fruits.

The digestibility of the nitrogenous material in cocoa and cocoa shells, S. GOR (*Biochem. Ztschr.*, 58 (1913), No. 1-2, pp. 137-147).—Experiments showed that roasting lowered the digestibility of the nitrogenous material of cocoa, the amount being proportional to the time of roasting and the temperature. The author's recommendation is accordingly made that roasting should be carried only far enough to develop the desired aroma.

Marked differences were noted in the digestibility of the protein of different sorts of cocoa, the coefficients of digestibility of total protein ranging from 45.62 to 72.45 per cent. Considerable variations were also noted in the digestibility of the protein of cocoa shells, the highest range being from about 48 to 58 per cent in the different samples.

Celery seed, A. JUILLET (*Ann. Falsif.*, 6 (1913), No. 62, pp. 671-674, figs. 2).—Histological data are given with reference to the identification of celery seed in materials used as seasoning.

The complete official proceedings of the 17th annual convention of the Association of American Dairy, Food, and Drug Officials, at Mobile, Alabama, June 16-20, 1913 (*Amer. Food Jour.*, 8 (1913), No. 7, pp. 195-298, pl. 1, figs. 39).—This contains the full report of the sessions of this meeting of the association together with the papers and discussions there presented.

Report of the Commonwealth and States of Australia, second conference on uniform standards for foods and drugs (*Melbourne: Govt.*, 1913, pp. 47).—As a result of the conference general recommendations are made for standards and regulations regarding labels, preservatives, flavorings and colorings, packages and containers, poisonous metals in foods, and other related topics. The numerous specific regulations formulated have to do with flour, bread and meals, vegetables, meats, milk and milk products, condiments and spices, and so on, as well as some drug products and soaps. Especially noteworthy are the regulations for the protection of food from contamination and the large amount of attention paid to this subject.

The new cookery, LENNA F. COOPER (*Battle Creek, Mich.*, 1913, pp. 9+298, pls. 5).—This volume is made up very largely of recipes and directions for preparing breads, soups, entrées, desserts, and other dishes. Milk and some milk products, eggs, and some commercial meat substitutes and other commercial goods are mentioned in addition to vegetable products, but the recipes do not include meat and meat products.

Some menus of meals made up of the kinds of food referred to in the book are appended, and there is an introductory chapter briefly referring to theories of nutrition from the standpoint of one who believes in low proteid and lacto-vegetarian diet.

Cooking by G. A. S., compiled by HELEN EDDEN, edited by MRS. M. A. C. BRERETON (*Westminster, [London]*, pp. 126, figs. 20).—Ways in which gas can be used in cookery are discussed and directions for using gas for such purposes are given, together with a large number of recipes suitable for gas cookery and some suggestions for quickly cooked meals and a number of menus.

[Electricity for cooking and heating] (*Jour. Gas Lighting*, 125 (1914), No. 2643, pp. 21, 22).—A review is given of the progress in such uses of electricity during the past year.

The value of sanitation as applied to railway and other large corporations, M. C. THRUSH (*Jour. Amer. Med. Assoc.*, 61 (1913), No. 14, pp. 1286-1288).—In

this article, which makes definite recommendations regarding railway sanitation, attention is to be paid to the need for supervision of the health and physical condition of employees concerned with the preparation and service of food, measures which shall insure sanitary conditions in providing water supply on railroad trains, and similar topics, in order that cleanliness may be insured and the possible spread of disease prevented.

Healthy employees in kitchen and dining room, G. HOMAN (*Jour. Amer. Med. Assoc.*, 60 (1913), No. 19, p. 1479).—A discussion based on the article abstracted above, endorsing the sanitary measures proposed.

Clean hands [in relation to food sanitation] (*Jour. Amer. Med. Assoc.*, 61 (1913), No. 17, pp. 1542, 1543).—This is a brief summary of data in which are pointed out the danger of conveying disease (typhoid fever) by contact of soiled fingers with food and the need for supervising the health of persons who prepare and handle food. "The supervision of cooks and waiters in dining cars, hotels, restaurants, and clubs is certainly a matter that deserves more attention than it has yet received."

Notes on the increased cost of living, A. DUCKWORTH (*Rpt. Austral. Assoc. Adv. Sci.*, 13 (1911), pp. 505-507).—In this discussion of the subject with reference to Australasian conditions, the author notes that the increased cost of living in recent years has been variously estimated at from 10 to 25 per cent in Australia and that the rise in New Zealand has been equally pronounced.

Domestic economy—the family budget, G. FLETCHER (*Dept. Agr. and Tech. Instr. Ireland Jour.*, 13 (1913), No. 4, pp. 735-739).—In this excerpt from a paper read at the Twelfth Annual Congress of the Irish Technical Instruction Association the importance of family budgets is insisted upon and a plan proposed for securing a detailed family budget regarding the household of the Irish artisan living in an urban center.

Studies from the department of physiology, II (*Cornell Univ. Med. Bul.*, 3 (1913), No. 1, pp. 220, pls. 4, figs. 7).—This collection of 12 reprints from current periodicals describes work of G. Lusk and his associates, done in 1912-13 in the physiological laboratory of Cornell University Medical College, and is mainly concerned with the results of experiments made with the respiration calorimeter. See also previous notes (*E. S. R.*, 30, p. 365.)

Concerning the absolute vegetarian diet of Japanese monks, III, IV, G. YUKAWA (*Arch. Verdauungskrank.*, 19 (1913), No. 3, pp. 356-370; *abs. in Zentbl. Expt. Med.*, 4 (1913), No. 10, p. 445).—To secure further data, the author made 2 more experiments, each with 2 Buddhist monks as subjects. Rice of the best quality was used instead of rice collected from various sources, as in his experiments previously reported (*E. S. R.*, 23, p. 372).

In the first of these experiments, the subjects, aged 38 and 28 years, and weighing, in round numbers, 53 and 48 kg., respectively, did no muscular work. The diet, which consisted of rice and barley, supplemented by soy bean products and similar materials, contained on an average 67 gm. protein and 2,099 calories, or 39.54 calories per kg. of body weight. Full details regarding these subjects are not reported.

In the second of the tests the subjects were 25 and 21 years old, weighing, in round numbers, 54 and 51 kg., respectively. These subjects performed some muscular work, including walking. Soy bean products with vegetables and similar foods were used with the rice, which was the principal article of diet. Foods and excretory products were analyzed, phosphoric acid and sodium chlorid being determined in the urine as well as nitrogen and specific gravity. The daily diet of one of these subjects contained 76 gm. protein, 16 gm. fat, and 587 gm. carbohydrates, and of the other, 63 gm. protein, 14 gm. fat, and 471 gm. carbohydrates. The energy values were 2,864 calories and 2,320 calories,

respectively. The diet supplied on an average 69 gm. protein and 2,592 calories of energy, or 46.4 calories per kg. of body weight.

From this experiment the author draws the same conclusion as formerly, namely, that the absolute vegetarian diet of the Buddhist monks studied, which had a minimum energy value, sufficed for maintaining health. The fact that the whole body, and particularly the digestive apparatus, was accustomed to such a diet is regarded as of special importance.

The rate of elimination of nitrogen as influenced by diet factors.—I, The influence of the texture of the diet; II, The influence of carbohydrates and fats in the diet; III, The influence of the character of the ingested protein, L. B. MENDEL and R. C. LEWIS (*Jour. Biol. Chem.*, 16 (1913), No. 1, pp. 19–36, figs. 9, 37–53, figs. 9, 55–77, figs. 12).—This work includes the results of a long series of digestion experiments with laboratory animals (dogs) in which the effects of a standard diet are compared with those of similar diets modified as indicated by the subtitles. The authors summarize the work as follows:

“Apart from the character of the protein ingested a large number of diet factors—the water intake, the presence and nature of indigestible materials in the diet, the amount and character of the carbohydrate fed, and to some extent the presence of fat in the diet—play a rôle in modifying the rate of elimination of nitrogen after a meal containing protein. With most of the proteins studied the nitrogen output curves differed to only a slight extent from one another; and in no case did the nature of the protein have a greater effect on the rate of nitrogen elimination than some of the nonprotein diet factors mentioned above.”

On the variations in the excretion of endogenous uric acid produced by changes in diet, G. GRAHAM and E. P. POULTON (*Quart. Jour. Med.*, 7 (1913), No. 25, pp. 14–28; *abs. in Zentbl. Biochem. u. Biophys.*, 15 (1913), No. 23, pp. 910, 911).—In metabolism experiments with normal subjects living on purin-free diets, it was found that the amount of uric acid excreted varied with the character of the diet. When protein and fat were given in quantities insufficient to supply the energy requirements of the body, the excretion of endogenous uric acid decreased 30 to 50 per cent. A similar effect was noted during the first day of a fasting experiment and also with a carbohydrate and fat diet. The most probable explanation seems to the authors to be found in the alternating action of protein and carbohydrate metabolism.

The alleged excretion of creatin in carbohydrate starvation, G. GRAHAM and E. P. POULTON (*Proc. Roy. Soc. [London]*, Ser. B, 87 (1914), No. B 594, pp. 205–220, fig. 1).—According to the authors' conclusions, a carbohydrate-free diet did not cause the excretion of any creatin. Experimental methods are critically studied.

On fat absorption.—III, Changes in fat during absorption, W. R. BLOOR (*Jour. Biol. Chem.*, 16 (1914), No. 4, pp. 517–529).—Continuing previous work with dogs (E. S. R., 29, p. 768), the author notes the following changes in fats during absorption:

The melting point of high melting point fats is lowered by the addition of an unsaturated fatty acid, probably oleic. The melting point of a low melting point fat (olive oil) is elevated and the iodine number is lowered by the addition of saturated fatty acids. Fats consisting mainly of glycerids of saturated fatty acids (coconut oil) undergo no change of melting point by the addition of “oleic acid” accompanied by a change in their molecular weight. The iodine number of fat containing a large percentage of glycerids of highly unsaturated fatty acids (cod liver oil) is lowered.

“The intestine appears to have the power to modify radically the composition of the fats during absorption. The changes are apparently purposive in that

they vary in kind and degree with the nature of the fat fed, and also show in general a tendency toward the production of a uniform chyle fat, presumably the characteristic body fat of the animal."

It is suggested that one purpose of the peculiar mechanism of fat absorption is to permit such adaptive changes. The work is being continued.

Further experiments concerning normal and pathological digestion in dogs, E. S. LONDON ET AL. (*Hoppe-Seyler's Ztschr. Physiol. Chem.*, 81 (1912), No. 5-6, pp. 369-438).—In this article are brought together 15 papers by London and associates reporting details of extended and valuable investigations on digestibility made with laboratory animals (dogs). For an adequate understanding of the work, the original papers should be consulted.

Studies of growth.—I, Growth with food containing vitamin and with vitamin-free food, C. FUNK (*Hoppe-Seyler's Ztschr. Physiol. Chem.*, 88 (1913), No. 5, pp. 352-356, No 1).—The laboratory animals selected for these experiments were chickens, as, according to the author, they resemble man with respect to the effects of vitamin-free diet.

In general, the results showed that chickens did not grow even when the food (polished rice) supplied a vitamin, and so it appears that the vitamin needed for growth is not identical with the vitamin which prevents beri-beri. According to the author, recent experiments indicate the theory of a specific growth-stimulating substance not in the food. The substance is presumably present in a negative form and becomes active through the agency of certain glands, probably the hypophysis.

The report contains a brief reference to the effect of vitamins on mammalian groups, a subject which the author is also investigating.

Studies on pellagra.—I, The influence of the milling of maize on the chemical composition and the nutritive value of maize-meal, C. FUNK (*Jour. Physiol.*, 47 (1913), No. 4-5, pp. 389-392, fig. 1).—The close resemblance of pellagra to other deficiency diseases (beri-beri and scurvy) led the author to formulate "a new hypothesis which regards pellagra as due to a lack of vitamins in the food."

In addition to the ash constituents, amino nitrogen with the corresponding melanin nitrogen, phosphorus, fatty acids, cholesterol, and lipid phosphorus were determined in whole maize grain, highly milled meal representing 86 per cent of the grain, and its bran in 2 fractions, (namely, the first milling, which consisted of the skin with a part of the superficial aleurone layer, and the second milling, which represented the main part of the aleurone layers and the germ). Specially ground, slightly milled meal deprived of the skin with a little adjacent layer, which represented 97 per cent of the entire grain, and the corresponding bran were also analyzed. Besides the analyses enumerated, the different samples were tested for the color developing with the phosphotungstic-phosphomolybdic reagent.

"The results obtained show beyond doubt that the distribution of vitamins in the grain of maize resembles closely that of rice. . . . [The analytical data show] that highly milled maize is deprived of some important constituents, such as phosphorus, both the total and the lipid phosphorus and also fat. This meal is also deprived to a great extent of the substance giving the color reaction. On the other hand we see that the millings which are thrown away or given as food for cattle are extremely rich in all constituents. From the analytical data we can say that there are four distinct layers in the maize grain. First the external layer, the skin, very poor in all constituents, underneath which is a layer which gives the above mentioned color reaction, then a third layer (included in which is the germ) extremely rich in proteins, fat, lipoids and salts; finally the fourth layer, the starch endosperm."

The author points out reasons for believing that products very rich in vitamin should show a difference in nitrogen when analyzed by the Dumas and the Kjeldahl methods. Analyses showed that "the fraction of the maize grain which contains the skin with adjacent layer gives in reality a considerable difference in the content of nitrogen, the Dumas method giving much higher results than the Kjeldahl method. This difference, however, is due very likely to the presence of methane, a decomposition product of methoxylated cellulose derivatives."

Similar tests with yeast led to the conclusion that although this "is so rich in vitamins, the amount of vitamin nitrogen to the total nitrogen must be a negligible quantity. Whether concentrated vitamin extracts will give a perceptible difference or not future investigations will determine.

"As regards the color reaction, which is without any doubt due besides to the presence of vitamins to an admixture with other substances, its value at present is limited; we notice, however, that the meal extracted in heat with alcohol yields comparatively less color than the meal extracted in cold. This suggests that heating diminishes the content of color-giving substances to some extent."

In his summary the author points out that, from the observed differences in the chemical composition of the four distinct layers of the corn kernel, "it would seem probable that the vitamins are distributed in the external layers of the grain. This explains why according to the mode of preparation of maize-meal in different countries the manifestations of pellagra vary from mild to severe forms.

"We are not able to say at the present moment which of the three external layers is more likely to contain the bulk of the vitamins. Besides vitamins the grain is deprived during the process of milling of a great quantity of salts, proteins, fat, and lipoids.

"The result of this investigation is that for the present moment it would be advisable to abandon the present mode of milling since only the whole grain including the skin can be regarded as a complete food."

It is the author's intention to test his theories by means of laboratory experiments with animals.

The physiological value of certain hitherto unknown constituents of foods, the vitamins, C. FUNK (*Ergeb. Physiol.*, 13 (1913), pp. 125-205, pl. 1, figs. 5).—A summary and discussion of the author's extended experiments, including work noted on page 865.

Studies on water drinking: XIII, Fasting studies.—VIII, Hydrogen ion concentration of feces, P. E. HOWE and P. B. HAWK (*Jour. Biol. Chem.*, 11 (1912), No. 2, pp. 129-140).—The hydrogen ion concentration of the feces of 3 men was determined, 2 in a series of water drinking experiments and the third in a fasting test, as well as in preliminary and final periods.

According to the authors, "the reaction of the feces was uniformly alkaline, the hydrogen ion concentration varying between 0.15×10^{-8} and 9.8×10^{-8} . As the result of water drinking with meals there was a tendency for the hydrogen ion concentration to increase. Pronounced changes in the dietary régime, such as high protein, low protein, and fasting did not affect the hydrogen ion concentration of the feces sufficiently to cause other than small variations in the uniformly alkaline reaction. As the result of fasting, the stools were alkaline in reaction (hydrogen ion concentrations of 1.4×10^{-8} and 0.94×10^{-8}) as opposed to the acid stools reported by previous investigators. The hydrogen ion concentration differs for the feces of different individuals living on the same diet."

Fasting studies.—IX, On the differential leucocyte count during prolonged fasting, P. E. HOWE and P. B. HAWK (*Amer. Jour. Physiol.*, 30 (1912),

No. 2, pp. 174-181).—As the authors point out, changes in the distribution of various forms of leucocytes in the blood during prolonged fasting have received little attention from investigators. The majority of observations have been confined to the enumeration of the erythrocytes and leucocytes and the estimation of the hemoglobin.

According to the author's conclusions, the data obtained in the case of 2 fasting men indicate an increase in the percentage of the polymorphonuclear leucocytes at the beginning of the fast, followed by a decrease below the normal at the end of 7 days; the opposite conditions held for the lymphocytes. An increase in the percentage of large lymphocytes during the earlier part of each fast was noted. One of the subjects showed an increase in the eosinophilic leucocytes which continued through the post-fastings feeding period. When food was taken after fasting a tendency was noted for all the forms of leucocytes to return to the normal.

Fasting studies.—X, A note on a glycogen-free liver, P. B. HAWK (*Jour. Amer. Chem. Soc.*, 34 (1912), No. 6, pp. 826-828).—Dog liver and a portion of muscle were examined for the presence of glycogen after fasting for periods of 117 and 104 days respectively (*E. S. R.*, 27, p. 465). None was found.

The relation of the feeling of fatigue to the CO₂ output during static muscular work, K. FRUMERIE (*Skand. Arch. Physiol.*, 30 (1913), No. 4-6, pp. 409-437, figs. 5).—The experiments here reported were made with apparatus devised by Johansson (*E. S. R.*, 13, p. 580; 14, p. 789) and the Tigerstedt-Sonden respiration chamber. Under the conditions of the experiments there appeared to be no relation between the output of carbon dioxide and the feeling of fatigue, but the oncoming of the latter bore definite relations to the character of the muscular contractions, and the pain which accompanied its later stages was attributed to the mechanical irritation of the corpuscular nerve ends in muscles, sinews, joints, and periosteum.

ANIMAL PRODUCTION.

The calcium and phosphorus supply of farm feeds, and their relation to the animal's requirements, E. B. HART, H. STEENBOCK, and J. G. FULLER (*Wisconsin Sta. Research Bul.* 30 (1914), pp. 28, figs. 2).—On the basis of figures obtained mainly from Wolff's tables of plant ash analyses and of previous results obtained at the Rothamsted Station and elsewhere on the calcium and phosphorus requirement of swine and ruminants it is concluded that "grains are deficient in calcium, but rich in phosphorus. Rations wholly made up of grains will supply to the growing animal an amount of calcium dangerously near a critical level of intake.

"Swine, growing or breeding, and confined wholly to grain rations should receive an additional supply of calcium either as calcium carbonate, calcium phosphate, or legume hay.

"The roughages vary widely in calcium content. The straws contain the least, while legume hays are very rich in calcium. Ruminants and the horse consuming the usual roughage will ordinarily receive calcium enough for growth. This is especially true when the roughage has been grown on a calcium-rich soil.

"For continued and high milk production, with its extra drain of calcium, the supply may be dangerously low unless legume hays form a part of the ration or calcium is furnished in other forms. When grain forms a liberal part of the ration the supply of phosphorus will be abundant under almost all conditions of animal life."

The results of metabolism experiments carried on with swine indicate that the addition of calcium carbonate or calcium phosphate to grain rations increases the retention of both calcium and phosphorus and results in the formation of a heavier skeleton.

"The relative efficiency of calcium carbonate and calcium phosphate in increasing the retention of phosphorus depends in a measure upon the amount of phosphorus present in the grain. The addition of calcium carbonate to a grain ration increases the calcium and decreases the phosphorus in the urine.

"The addition of calcium phosphate does not influence the amount of calcium and does not always influence the amount of phosphorus excreted in the urine. Additional calcium supplied to growing swine increases the size of the shaft of the bone, but the length or rate of growth is not influenced.

"High calcium rations, as compared with low calcium rations, had no effect whatever during a single gestation period on the size or calcium content of the skeleton of the fetus. The skeleton is not increased in any dimension by a wide variation in the amount of calcium fed the mother."

Studies of the natural pasture grasses of Uruguay, J. PUIG Y NATTINO (*Rev. Min. Indus. Uruguay*, 1 (1913), No. 3, pp. 82-97).—The composition, distribution, and relative feeding value of 20 of the natural pasture grasses of Uruguay are reported. These include orchard grass, rescue grass, meadow fescue, rye grass, wild oats, plantain, blue joint, and others.

Sugar-beet pulp for feeding live stock (*Jour. Bd. Agr. [London]*, 20 (1913), No. 9, pp. 784-793).—This is a review of English, German, and American experiments in feeding sugar-beet pulp to various classes of farm stock.

Commercial feeding stuffs, J. P. STREET (*Connecticut State Sta. Rpt. 1913*, pt. 5, pp. 309-351).—Analyses are reported of the following feeding stuffs: Cotton-seed meal, linseed meal, wheat bran, gluten meal, hominy feeds, corn meal, rye middlings, buckwheat middlings, malt sprouts, dried brewers' and distillers' grains, alfalfa meal, dried-beet pulp, molasses feed, ground corn-stalks, corn kernels, beef scrap, ground brush, cocoa siftings, peanut hearts, bakery refuse, North Carolina grass, meadow hay, and various mixed and proprietary feeds. There are also included data showing short weights on bagged feeds and a table giving the average composition of 436 fodders and feeds analyzed at the station, 1878-1913.

Commercial feeding stuffs of Pennsylvania in 1912, J. W. KELLOGG ET AL. (*Penn. Dept. Agr. Bul. 234* (1913), pp. 227).—The average analysis and retail price of the following feeding stuffs are reported: Cotton-seed meal, gluten meal, linseed meal, distillers' grains, brewers' grains, buckwheat middlings, malt sprouts, wheat middlings, low-grade flour, rye middlings, corn-oil meal, wheat bran, molasses feed, alfalfa meal, hominy feed, corn bran, dried beet pulp, oat hulls, meat scrap, and various mixed and proprietary feeds.

Animal economy section (*X. Cong. Internat. Agr. Gand, 1913, Compt. Rend.*, pp. 241-257).—This is merely the minutes of this section of the congress, recording the papers and discussions relating to animal economy that came before that body, as previously noted (*E. S. R.*, 29, p. 104).

Division of animal husbandry (*Philippine Agr. Rev. [English Ed.]*, 6 (1913), No. 12, pp. 595-602, 591-593, pls. 2).—Feeding experiments with swine indicate that the substitution of papaya for a portion of grain ration materially increases daily gains, although an entire ration of papayas was not satisfactory.

The results of a test with kapok seed meal indicate that it may be used to form a valuable adjunct feed for cattle, although it is a fat rather than a muscle producing feed and could perhaps be used more advantageously in finishing cattle for market than for the feeding of work cattle. When fed to swine it was found that the meal had a poisonous effect.

Progress reports are given of the horse, cattle, swine, goat, and sheep projects under way at the several stations. It is reported that the pure-bred Nellore herd of cattle has thrived in spite of a dry season and sparse pasture conditions. Hereford grades from Chinese dams produced during the year very promising calves, showing characteristics of the sire to a marked degree; the only objection to these offspring was the slight woolly coat which makes them liable to tick infection. An objection to the Nellore breed is its extreme legginess and rangy body conformation. The grades seem to be much blockier or beefy, more docile, earlier maturing, and apparently better rustlers. They are much larger than the native or Chinese dams and are immune or highly resistant to rinderpest.

The Berkshire breed has proved well adapted for the upgrading of the native swine; the first cross shows a preponderance of the pure-bred characteristics and appears practically as well adapted to local conditions as the native stock.

Studies on the prehistoric Moravian cattle, F. MOHAPL (*Mitt. Landw. Lehrkanz. K. K. Hochsch. Bodenkul. Wien*, 2 (1913), No. 1, pp. 75-97, pls. 4).—As the result of studies and skeletal measurements of the prehistoric cattle of Moravia the author concludes that these cattle were of either the *Bos frontosus* or *B. brachycephalus* type, and disagrees with Werner in his statement that they were of the *primigenius* race.

The Flemish breed of cattle, H. RAQUET (*Rev. Min. Indus. Uruguay*, 1 (1913), No. 4, pp. 40-53, figs. 15).—This article treats of the breed characteristics and utility value of the Flemish breed of cattle, and discusses the importation and adaptability of the breed to Uruguay conditions.

Studies on Hannaberner cattle, F. MOHAPL (*Mitt. Landw. Lehrkanz. K. K. Hochsch. Bodenkul. Wien*, 2 (1913), No. 1, pp. 99-174, pls. 4).—A study was made of the body characteristics and skeletal measurements of the Hannaberner cattle of Moravia and comparisons made with those of the Simmentaler and other types of Northern Europe.

Studies on the Irish-Kerry cattle, E. LUNDWALL (*Mitt. Landw. Lehrkanz. K. K. Hochsch. Bodenkul. Wien*, 2 (1913), No. 2, pp. 331-374, pls. 10).—A study of the body characteristics and skeletal measurements of the Kerry cattle of Ireland, with comparisons of those of the Bretagne and Polish Red cattle. There is given an account of the crossing of the Kerry and Dexter cattle, forming a breed known as the Dexter-Kerry. It is believed that the original cattle were of the brachycephalous type.

White cattle of Italy, N. B. STEWART (*Daily Cons. and Trade Rpts. [U. S.]*, 17 (1914), No. 24, p. 384).—It is stated that the white cattle which predominate in northern Italy are of the Piedmont breed and are particularly suitable as work animals. The Piedmont bull weighs from 2,200 to 2,400 lbs., while the cow weighs from 1,200 to 1,550 lbs. There are several other breeds of white cattle in Italy. None of these has been exported to North America.

Inbreeding and heredity studies with cattle of the West Prussian herd book, G. HESSE (*Arb. Deut. Gesell. Züchtungsk.*, No. 18 (1913), pp. VI+215).—This reports extensive studies made of the blood lines of 3 prominent herds of cattle in West Prussia to determine the relative influence of inbreeding upon offspring. It is concluded that the prospects of success with inbreeding are most propitious, provided systematic methods are employed.

Experiments in steer feeding in Manitoba, W. C. MCKILLICAN (*Canada Expt. Farms Bul.* 13, 2. ser. (1913), pp. 21, fig. 1).—The principal conclusions of the work reported in this bulletin, which is a summary of tests conducted at the experimental farm at Brandon, Manitoba, from 1892 to 1912, and for the most part previously noted, are as follows:

Good results can be obtained with straw and grain, although the addition of roots or silage improves a ration. Hay and oat sheaves give larger gains than straw. Steers fed loose in a box stall do better than when tied. Dehorning gives little or no setback and makes loose feeding practicable. While steers may be fattened successfully outdoors in winter in Manitoba if sheltered from the wind, somewhat greater gains may be secured if fed in a stable. The advantage of feeding oats, barley, or low-grade wheat to steers over marketing through the elevator was demonstrated.

Cattle-feeding experiments, W. BRUCE (*Edinb. and East of Scot. Col. Agr. Rpt. 31 (1913), pp. 16*).—This is a continuation of work previously noted (E. S. R. 29, p. 272). Three lots of 16 steers each, weighing approximately 825 lbs., were fed for a period of 133 days on the following average daily ration per head: Lot 1, 3.95 lbs. linseed cake, 3.78 lbs. Bombay cotton cake; lot 2, 5 lbs. bran, 3.78 lbs. cotton cake; and lot 3, 7.73 lbs. of a mixture consisting of cotton cake, bran, linseed cake, decorticated cotton cake, and maize meal, 2:3:1:1:1. In addition all the lots received an average daily allowance of 102 lbs. swedes and 7.78 lbs. oat straw per head.

It is estimated that lot 1 received 14.19 (Kellner) starch equivalents daily; lot 2, 13.7; lot 3, 14.12; and that the balance available for fattening purposes after 6 units were deducted for maintenance was in the proportion of 100:94.01:99.08 for the respective lots. The average daily gain was in the proportion of 100:98.8:100.13.

The total gain in weight per head was for lot 1, 270.4 lbs.; lot 2, 267.3 lbs.; and lot 3, 270.8 lbs. In dressing percentages the bran-fed lot was 0.9 per cent higher than the other lots, the result conforming to results in former trials.

The sheep of Bosnia and Herzegovina, M. MEHMEBASIC (*Mitt. Landw. Lehrkanz. K. K. Hochsch. Bodenkul. Wien, 2 (1913), No. 2, pp. 307-330*).—This reports studies on the body characteristics, skeletal measurements, and milk, wool, and mutton utility value of the sheep of Bosnia and Herzegovina (*Ovis strepsiceros*).

Fecundity of sheep, J. R. AINSWORTH-DAVIS and D. TURNER (*X. Cong. Internat. Agr. Gand, 1913, Sec. 3, Question 4, pp. 5*).—With the object of testing the extent of inheritance of the "twinning faculty" in sheep, 12 Oxford Down twin ewes were secured by the Royal Agricultural College, Cirencester, and bred to a pedigree Oxford Down ram twin. Six of the ewes were mixed twins, i. e., one of each sex; and 6 were ewe twins, i. e., both females.

From the 3 seasons during which the trials were conducted "all the twins produced in 1910 and 1911 were born by the ewes from mixed twins. This was not confirmed, however, in 1912. The twins were mostly mixed, and there was no case of ram twins in the 3 years. The ewes of lot 1 (mixed twins) produced throughout, taking twins and singlets together, a much higher percentage of ewe lambs than ram lambs. The ewes of lot 2 (ewe twins) gave birth to a much higher percentage of ram lambs."

Due to the paucity of the experimental flock, no definite conclusions are to be drawn. However, the work is to be continued and the line of research broadened.

Annual wool review for 1913 with estimate of domestic wool clip of 1913 and other statistical tables, W. J. BATTISON (*Bul. Nat. Assoc. Wool Manfrs., 44 (1914), No. 1, pp. 1-63, pl. 1*).—This is a résumé of the present wool situation in the United States, with special reference to the effects of the Simmons-Underwood tariff act which puts wool on the free list. Statistical data are given on the number of sheep for 1913; the wool product; fleece; pulled and scoured wool; value of wool products; exports and imports; the slaughter and movement of sheep; the course of prices; comparative prices of

domestic wool in Boston, 1899-1913; mohair production in the United States; imports of wool and wool manufacturers; London wool sales; Liverpool East India wool sales; Antwerp wool auctions; South American wool production; Australian wool and sheep statistics; South African wools; number of sheep in the world; and wool production of the world.

On the wild and domestic swine of the pile works in the Laibach moor and on the relation of these swine to an extinct race, S. ULMANSKY (*Mitt. Landw. Lehrkanz. K. K. Hochsch. Bodenkul. Wien*, 2 (1913), No. 1, pp. 17-74, pls. 4).—After a very complete study of skeletal remains of prehistoric swine found around the pile works of the Laibach moor, the author concludes that the wild or turf swine occupy a middle position between the 2 species *Sus scrofa* and *S. vittatus*, and that the present-day wild swine of Bosnia Herzegovina represent a similar type. The relation of these swine to other more modern wild swine of Europe and Asia is discussed.

Brood sows and their litters, R. L. HILL (*Chicago*, 1913, pp. 89, figs. 25).—A practical book dealing with the feed, care, and management of the brood sow and her litter.

Studies of the body, heart, and lung weights of the improved native and Berkshire breeds of swine, A. SEMMLER (*Jahrb. Wiss. u. Prakt. Tierzucht*, 8 (1913), pp. 88-137).—In a study of the dressing weights and lung and heart capacities of swine it was found that male animals have a larger heart weight in proportion to live weight than female animals, and that heart weights of Berkshire swine are relatively smaller than of the native white swine. There was found to be a correlation between the size of heart and body weight, the larger heart being associated with greater weight, accounted for because of the greater blood circulation, thus aiding in the digestive process and in the assimilation of food. There was no relation between lung weight and lung capacity, the lightest lung weight not necessarily meaning a low capacity of volume.

On the average, large lung capacity is associated with greater live weight, and from these observations it is concluded that feeding and management methods should be so conducted as to be conducive to the growth of large lung capacity. It was observed that the lungs of young animals are relatively large; of fat animals in advancing age, small; and of breeding animals, large. Measurements made of the breadth and depth of the breast indicated that on the average large measurements are accompanied by large heart and lung weight and that these relationships are fairly constant. The length of body with advancing age is associated with greater lung and heart weight. Increasing height at the withers in fat swine was associated with smaller lung and heart weight, but in breeding animals with larger lung and heart weight.

There was found to be a large variation in the relation between the outer breast measurements and the lung capacity, depending upon age, breed, and individuality of animals. With advancing age the lung capacity of the female animal is proportionately larger than that of the male. The pure-bred Berkshire has a lower lung capacity than the improved native, and breeding swine a larger lung volume than castrated fat swine.

The author points out that the lung capacity depends upon the lung tissue and vesicles, rather than their weight, and concludes that it is impracticable to attempt to determine lung capacity by the size and exterior measurements of an animal.

Experiments with swine on the effect of nonprotein nitrogen compounds upon the nitrogen intake, A. KÖHLER (*Landw. Vers. Stat.*, 79-80 (1913), pp. 623-636).—A report of feeding experiments with the nonprotein nitrogen feeds asparagin and ammonium-acetate solution, in which it was found that the

nitrogen intake was lowered below normal when these substances were fed. This was in contrast to the results obtained when the proteid feed gluten was included in the ration, for in this case the nitrogen intake was materially increased.

The Missouri saddle horse, E. A. TROWBRIDGE, R. JACKSON, ET AL. (*Missouri Bd. Agr. Mo. Bul.*, 11 (1913), No. 10, pp. 95, figs. 35).—This bulletin contains articles on the following subjects: Recent saddle horse history in Missouri, the foundation of the present saddle horse industry in Missouri, saddle horses in Cooper County, Mo., and the American saddle horse and Americans, together with an account of the proceedings of the annual meeting of the Missouri Saddle Horse Breeders' Association, 1913.

Report of the stallion enrollment board of Ontario, 1913 (*Ann. Rpt. Stallion Enrollment Bd. Ontario*, 1 (1913), pp. 38).—This report contains an account of the history of the movement for the enactment of legislation on stallion registration in Ontario, the text of the Ontario laws and regulations, and a review of the present status of stallion registration in Canada and the United States, together with a table showing results of inspection for the Province of Ontario, 1912-13, with the causes for rejection.

Proceedings of the American Poultry Association (*Proc. Amer. Poultry Assoc.*, 38 (1913), pp. 319, pls. 3, figs. 72).—This contains a complete account of the proceedings of this Association with a list of members, association judges, and the official show rules.

Our domestic birds, J. H. ROBINSON (*New York, Chicago, and London*, 1913, pp. X+317, pl. 1, figs. 236).—This book deals with the feed, care, and management of our domestic birds, including chickens, ducks, geese, turkeys, guineas, peafowl, pheasants, swans, ostriches, pigeons, and canaries.

Farm poultry, W. R. GRAHAM and A. C. McCULLOCH (*Ontario Dept. Agr. Bul.* 217 (1913), pp. 64, figs. 48).—This bulletin treats of the following subjects: Poultry house construction, egg production, feeding methods, incubation, rearing chickens, fattening chickens, eggs for market, and breeds of poultry, together with short notes on poultry work in Ireland, Scotland, England, and Denmark.

The results of 3 feeding trials, involving 745 pullets, indicate that the average cost per dozen eggs produced ranges from 11.16 to 13.08 cts., the average cost of feeding each bird per month from 10.06 to 10.88 cts., the average grain consumption from 5.66 to 6.2 lbs., and the average milk consumption from 7.1 to 7.8 lbs. It was further found that where beef scrap was fed in a hopper or when the birds could eat all they desired, the Leghorns and Rhode Island Reds did much better than the Orpingtons; that with all 3 breeds buttermilk produced the most and the cheapest eggs; and that no animal feed in all instances gave the best eggs for hatching and the lowest egg yield. On a no-meat ration the feather eating habit was developed by the Leghorns, and to a limited extent by the Rhode Island Reds, but not by the Orpingtons.

Poultry keeping on the farm, F. S. COOLEY ET AL. (*Mont. Farmers' Bul.* 3 [1913], pp. 162, figs. 36).—This bulletin contains articles on standard varieties of chickens, studies in incubation in Montana, modern incubation and brooding, principles of breeding, double matings and breeding show birds, housing poultry, feeds and feeding, profitable egg production, market poultry, capons and caponizing, preparing fowls for exhibition, the decimal system of judging, turkeys, water fowl, guineas and ornamental fowl, squab breeding, and diseases and hygiene. A reprint of Farmers' Bulletin 357 of this Department (E. S. R., 21, p. 274) is appended.

Origin and early history of the primordial germ cells in the chick, C. H. SWIFT (*Amer. Jour. Anat.*, 15 (1914), No. 4, pp. 483-516, figs. 15).—This article

reports extended studies made into the origin and development of the primordial germ cells of the chick.

Electrified chickens.—Electricity as a growth stimulator (*Sci. Amer. Sup.*, 77 (1914), No. 1986, p. 63, figs. 4).—An account of the successful use of electricity as a growth stimulator in poultry. It is thought that the high frequency currents stimulate the blood circulation by lowering the viscosity of the blood. It is not at present known whether prolonged electric action increases growth up to maturity or whether its whole effect is to cause the maximum size to be sooner reached.

On the ability of chickens to digest small pieces of aluminum, MAYNIE R. CURTIS (*Maine Sta. Bul.* 221 (1913), pp. 314–318, figs. 3).—In examining the gizzards of chickens it was found that pieces of aluminum leg bands which had been picked up by the chickens were undergoing dissolution, evidently due to a combination of the mechanical grinding of the gizzard and the action of the hydrochloric acid of the gastric juice. In the cases examined it was estimated that the aluminum pieces had been in the gizzard not longer than 9 weeks and that the dissolution was about 25 per cent. It is noted that the aluminum salt formed (aluminum chlorid) is nonpoisonous. It was observed that the birds possess a considerable individuality in regard to the tendency to swallow pieces of bright metal.

The 300-egg hen, J. DRYDEN (*Country Gent.*, 79 (1914), No. 2, pp. 46, 70, figs. 3).—An account of the 2 champion egg-laying hens of 1913, which produced 303 and 291 eggs, respectively, in one year. These hens were fed and bred by the Oregon Experiment Station and are the result of selective breeding by that station for 6 years. Selection has been made both of pure breds and crosses, but the latter method has given the best results. All the high egg records have been secured from hens having high producers as ancestors.

The 2 hens were of similar breeding, Plymouth Rock and White Leghorn, and were fed and cared for similarly to other birds in a flock of 40. The 291-egg hen began laying at the age of 5½ months. Five sisters, including the 303-egg hen, averaged 246 eggs each. Five of the best layers in the yard averaged better than 280 eggs; 26 out of 40 exceeded the 200-egg mark, and the whole flock averaged more than 200. The total weight of eggs laid by the 291-egg hen was 36 lbs., and that of the 303-egg hen 42 lbs. The author contends that the problem of increasing the egg yield is one of selection and breeding and that it is founded upon the individual hen and not upon the flock or the breed.

Practical packages for egg marketing (*Orange Judd Northwest Farmstead*, 12 (1914), No. 6, p. 157, figs. 6).—A description of a number of egg-carrying cases, cartons, and boxes.

The Indian Runner duck book, C. S. VALENTINE (*Ridgewood, N. J.*, 1913, 3. ed., rev. and enl., pp. 166, pls. 12).—This book includes chapters on the origin, history, and development of the Indian Runner duck, the utility value of this breed, feeding methods, and the marketing of eggs.

Goose fattening in Germany, A. O. SCHILLING (*N. Y. Produce Rev. and Amer. Cream.*, 37 (1913), No. 8, 384).—An account of the German methods of growing goose livers. It is stated that "the forced or unnatural growth of the liver to an abnormal size renders it more tender and also causes it to be of a better flavor than a liver taken from a goose which has not been specially fed for this purpose."

"The geese are about 6 months old when they are ready for fattening. They are first put into an outside inclosure for 3 or 4 days and fed on boiled corn, the object being to accustom them to confinement gradually and also to

get them prepared for their regular diet during the fattening process. They are fed on boiled corn 4 times during 24 hours by the cramming machine process. The corn is boiled about one-half hour or until it is soft to the touch when squeezed between the fingers. This cramming process is carried on regularly for about 4 weeks, after which period the goose is usually found to be ready for killing. During the course of this artificial feeding the liver is caused to grow to an abnormal size, while the flesh becomes soft, tender, and white."

Goose livers produced by the cramming process usually weigh from 12 to 32 oz. White geese are preferred as it is said these fatten more easily.

Experiments with ostriches.—XXII, The development of the feather, showing absence of cruelty in clipping and quilling, J. E. DUERDEN (*Agr. Jour. Union So. Africa*, 6 (1913), No. 4, pp. 648-661, figs. 12).—A continuation of earlier work (E. S. R., 28, p. 270). In this the author describes the growth, development, and final ripening of the ostrich plume and shows wherein no cruelty is involved in the clipping and quilling operations.

Ostrich breeding.—The preparation and trade of the plume, A. MENEGAUX (*L'Élevage de L'Autruche. Récolte et Commerce des Plumes. Paris, 1913, pp. 156, pl. 1, figs. 27*).—This is a very complete treatise on ostrich breeding and management for commercial purposes. It includes a description of the several breeds of ostriches, a study of the structure and development of the plume, the methods of preparing plumes for commercial use, the points of quality desired in ostrich plumes, and the methods of harvesting the plumes. Methods in the domestication and breeding of the ostrich are described, and the probable growth of the industry in the Transvaal, Southeastern Africa, Australia, Algeria, Tunis, Sudan, Madagascar, Egypt, the United States, and other places discussed.

A pedigree system for use in breeding guinea pigs and rabbits, F. M. SURFACE (*Maine Sta. Bul.* 221 (1913), pp. 306-313, figs. 4).—Methods of marking guinea pigs and rabbits and of keeping pedigree and mating records and indexes in experimental breeding work are described.

Guinea pigs, W. E. CLARKE (*New York and Chatham, N. Y., 1913, pp. 47, figs. 9*).—A practical treatise on the breeding, feeding, and management of guinea pigs.

DAIRY FARMING—DAIRYING.

Soiling crops v. silage for dairy cows in summer, F. W. WOLL, G. C. HUMPHREY, and A. C. OOSTERHUIS (*Wisconsin Sta. Bul.* 235 (1914), pp. 3-16, fig. 1).—The results of trials to determine the relative value of soiling crops and of silage for dairy cows in summer under Wisconsin conditions indicate that soiling crops of good quality yield approximately a similar production of milk to corn silage. For the 3 years the cows fed silage produced 65,727 lbs. milk, 8,684 lbs. solids, and 2,737.2 lbs. milk fat, as compared with 65,922.7 lbs. milk, 8,644 lbs. solids, and 2,701.36 lbs. milk fat for the cows fed soiling crops. The expense of producing and feeding these soiling crops was considerably greater than that of producing and feeding silage.

"Years in which the rainfall is below normal, and the pastures therefore poor, are also the years when soiling crops are likely to be scant or fail. The carrying over of the corn crop from one year to the next by means of the silo tends to equalize the quantity of feed available from year to year; hence insures against losses in milk production due to a scarcity of feed."

The soiling crops used in these trials were red clover, peas and oats, early sweet corn, late sweet corn, and succotash, consisting of a mixture of oats,

peas, and dent corn. Of the green crops planted clover and succotash proved the least palatable. Suggestions are given for the feeding of cows in summer and for the use of the summer silo.

Analyses of the various feeds are appended.

[Studies on the fat, total solids, and dirt content of milk], H. FISCHER (*Die Ergebnisse der Kontrolle einer Genossenschaftsmolkerei, insbesondere Untersuchungen über den Fettgehalt, den Trockensubstanzgehalt, und die Verunreinigung der Milch. Inaug. Diss., Ludwigs-Univ. Giessen, 1912, pp. 67*).—In these studies the maximum milk yield was found to be in April and May, with a gradual decrease toward the fall and winter months. The daily variation of fat content ranged from 0.1 to 0.25 per cent. The fat content of the milk was low in April and June, reaching its first maximum in July and its second maximum in December. High fat content was associated with a high total solids content. The nature of the food showed a specific influence on the character of the milk, a ration high in fat content giving milk of high fat content. The frequency and manner of milking showed an influence on the composition of milk, the last part of the milking being the richest.

Constants for normal variation in the fat content of mixed milk, R. PEARL (*Maine Sta. Bul. 221 (1913), pp. 299-305*).—In this paper the author applies biometric methods to the experimental data compiled by Klose (*E. S. R., 30, p. 474*).

The results indicate that in general in the mixed milk of a large dairy herd the percentage content of fat is lowest in the morning milk and usually highest in the evening milk. Without exception the absolute amount of fat is greatest in the morning milk, least in the evening milk, and intermediate in amount at the midday milking, these amounts being dependent upon the length of interval between milkings. The difference between morning and evening milk in percentage of fat content is significantly smaller in March and October than in May and July. The percentage of fat content of the total day's milk rises steadily from March through October, approximately one-half per cent, the greater part of this increase occurring between July and October, and indicating that pasture conditions were a significant factor in producing the result. The greatest absolute mean fat production per day was in May with but slightly lower production in July and October.

The percentage fat content of the mixed milk of a large herd exhibits a considerable variation from day to day. It is most variable in March and October and least variable in May and July. The absolute amount of fat produced per day is roughly about twice as variable relatively as is the percentage fat content of the milk, indicating that the larger variation exists in the milk yield of the herd rather than in the percentage fat content of the milk. The relative variation in absolute fat produced decreases steadily from March to October although this decrease is small and not significant. The milk of any particular milking of the day is no more variable in percentage of fat content than the milk of any other milking of the day and the total day's milk is relatively less variable in fat percentage than the milk from any single milking. In absolute amount of fat the evening milk is relatively much more variable than the morning's milk, indicating that during the night fat production in the udder is a more uniform process than during the daytime when the cows are in some degree active.

Testing milk and cream for butter fat, O. F. HUNZIKER (*Indiana Sta. Circ. 42 (1914), pp. 22, figs. 29*).—This circular contains general information on methods of testing milk, cream, skim milk, and buttermilk by the Babcock test.

The origin of some of the streptococci found in milk, L. A. ROGERS and A. O. DAHLBERG (*U. S. Dept. Agr., Jour. Agr. Research, 1 (1914), No 6, pp. 491-*

511, figs. 8).—The authors summarize their observations as follows: "A collection of cultures of streptococci was made consisting of 42 cultures from milk which formed chains in lactose bile at 37° C., 51 cultures from infected udders, 114 cultures from bovine feces, and 39 cultures from the mouths of animals.

"The morphology varied under different conditions and could not be correlated with the source of the culture, except that the udder cultures had a more marked tendency to chain formation than those from other sources. The ability of these cultures to liquefy gelatin and to form acid from dextrose, lactose, saccharose, raffinose, starch, inulin, mannite, glycerin, dulcite, and adonite was determined. Only one or two cultures utilized adonite or dulcite. When glycerin was attacked, the fermentation proceeded slowly, failing to reach its maximum in 14 days, in contrast to the fermentation of the sugars, in which the maximum was reached in two or three days.

"A high percentage of the udder cultures failed to give the characteristic reduction in litmus milk. Twelve cultures liquefied gelatin; one of these came from milk and 11 from infected udders. The cultures from feces were characterized by their activity in fermenting the sugars, including raffinose, and their inability to utilize the alcohols. The mouth cultures fermented dextrose, saccharose, lactose, mannite, and frequently raffinose, but were almost without effect on starch and glycerin. The udder cultures were characterized by the general lack of fermentive ability, which was limited almost entirely to dextrose, saccharose, and lactose, with a comparatively small number utilizing mannite, glycerin, and gelatin.

"When the udder cultures were divided on the basis of gelatin liquefaction, two groups were obtained. The fermentive activities of one of these, which are similar to those of *Streptococcus pyogenes*, were limited to dextrose, saccharose, and lactose, with an occasional culture fermenting mannite, starch, or inulin. The second group fermented the 3 simple sugars, mannite, and usually glycerin and liquefied gelatin. When the milk cultures were considered individually, it was found that with the exception of two which clearly came from feces they could be included in one or the other of the two groups into which the udder cultures were divided. Of the 41 nonliquefying udder cultures 24 gave identical reactions. The remaining cultures differed from the type in one or two characters only."

Dirt sediment testing.—A factor in obtaining clean milk, M. C. SCHROEDER (*Amer. Jour. Pub. Health*, 4 (1914), No. 1, pp. 50-64, figs. 12).—After describing the various methods of making sediment tests, both of the gravity filtration and centrifugalization types, the author gives the results of tests made of 416 samples of milk to ascertain the factors influencing gravity filtration.

It was found that 11 per cent of the samples filtered through the cotton in less than one minute, 68.9 per cent in from 1 to 3 minutes, 7.4 per cent in from 3 to 5 minutes, 4.3 per cent in from 5 to 10 minutes, 4 per cent in from 10 to 60 minutes, and 4 per cent in over 60 minutes. The filtration process did not seem to be affected by the fat content, total solids, or the amount of sediment present in the form of visible dirt, but a large excess of leucocytes or epithelial cells tended to retard the filtration. Colostral and stripper milk filtered through quite readily. Sweet cream diluted with an equal amount of warm water may be tested, but in testing sour cream it is necessary to dissolve the curd by the addition of an alkaline solution. A gauge has been devised for making comparative readings which represent the amount of dirt obtained by filtering liter lots of milk to which have been added respectively 2½, 5, 7, and 10 mg. of the material which usually finds its way into the milk.

Minnesota dairy and food laws (*Minneapolis, Minn., 1913, pp. 104*).—This is a manual of the state dairy and food laws, and the rules and regulations relating to dairy inspection, preservatives of dairy products, pasteurization of milk and cream, labeling of butter and cheese, shipment of cream, sale of oleomargarine, and other related subjects.

The dairy industry in New York State (*N. Y. Dept. Agr. Bul. 54 (1913), pp. 447, pl. 1, figs. 103*).—This bulletin includes the text of the laws in force in New York relating to dairying, together with articles on the country milk situation in the State, handling and delivering city milk, bacteria in milk, sanitary economical appliances in clean milk production, the milking machine, and other related topics.

Distribution of moisture and salt in butter, E. S. GUTHRIE and H. E. ROSS (*New York Cornell Sta. Bul. 336 (1913), pp. 3-21*).—The purpose of this bulletin is to show the variation of moisture and salt in butter as found on the market. The samples used in this study came from churnings in different parts of the State of New York, which were immediately sent to market, and were in every way representative of the butter that is on the various markets. The analyses for moisture were all run in duplicate by the gravimetric method. The salt analyses were made by the silver nitrate method.

It is stated that "of the 51 packages 9, or 17.6 per cent, showed a difference of 1 per cent or more of moisture in adjacent samples, and in 11 packages, or 21.6 per cent, there was a difference of 1 per cent or more between the lowest and the highest moisture tests. Of the packages 54.9 per cent showed a difference of 0.5 per cent of moisture or over in adjacent samples. There was a difference of 0.5 per cent or more of moisture between the lowest and the highest moisture test in 60.8 per cent of the packages.

"In 36.2 per cent of the packages there was a difference of 0.2 per cent of salt in adjacent samples, and 46.8 per cent of the packages contained a difference of 0.2 per cent salt between the lowest and the highest tests. There were 4 instances of adjacent moisture tests being the same, and in 7 packages there were 2 or more samples that tested the same. In 12 packages adjacent salt tests were the same, and in 22 packages there were 2 or more samples that were the same in salt content. Poorly made butter varied slightly more in moisture and salt than did well-made butter."

It is concluded from these observations that "in order to get an approximate test of the moisture in butter, a sample containing only a few portions of butter may be used; but if the legal limit has been reached and the exact composition is wanted, the sample must consist of many portions taken from different parts of the package."

A study of some factors influencing the yield and the moisture content of Cheddar cheese, W. W. FISK (*New York Cornell Sta. Bul. 334 (1913), pp. 515-538*).—In a study made of the factors which influence the yield and the moisture content of Cheddar cheese it was found that "cutting the curd fine causes a larger loss of fat in the whey than cutting the curd coarse. Coarse-cut curd increases the yield of green and of cured cheese and increases the moisture content of the cheese. If great care is not taken and the pieces of curd are broken, the result will be the same as a fine cut.

"Setting the milk at a high temperature reduces the loss of fat in the whey more than setting the milk at a low temperature. Setting at a high temperature increases the yield of the green and the cured cheese. This increase is probably due to the increased moisture content of the cheese. A low acid at the time of removing the whey increases the yield of the green and the cured cheese. The low acid also increases the percentage of moisture in the cheese.

If a high acid is developed, it not only reduces the yield and the percentage of moisture in the cheese, but also injures the quality of the cheese.

"Stirring the curd with the hand as the last of the whey is removed reduces the percentage of moisture in the green and the cured cheese. Stirring reduces the yield and causes a larger loss of fat in the whey. Pressing the curd fast reduces the yield because more fat is squeezed out of the curd. This loss of fat makes the cheese pressed fast appear to contain more moisture. If the curds are piled deep more moisture is retained in the green and the cured cheese. Piling the curds deep increases the yield of cheese. An increase of salt in the curd results in the reduction of moisture in the cheese.

"Holding the curd at a low temperature after the whey is removed increases the percentage of moisture in the green and the cured cheese and increases the yield. An increase of rennet to a certain point increases the moisture content of cheese. This is due to greater coagulation, and has the same effect as setting at a high temperature or cutting the curd hard. Cutting the curd soft reduces the percentage of moisture and the yield of the green cheese, and also increases the loss of fat in the whey. Cutting soft has the same effect as setting at a low temperature or as a small amount of rennet."

A bibliography is appended.

The manufacture of cheeses in the Grisons from skimmed cow's milk and whole goat's milk, and the utilization of these milks in Germany, H. KRAEMER (*Mitt. Deut. Landw. Gesell.*, 28 (1913), Nos. 6, pp. 84-87; 7, pp. 103-105; 9, pp. 149-151; *abs. in Internat. Inst. Agr.* [Rome], *Mo. Bul. Agr. Intel. and Plant Diseases*, 4 (1913), No. 4, pp. 641, 642).—An account of a method of manufacturing skim milk cheese in Switzerland in which mixed cow's and goat's milk is employed. By this method the skimmed cow's milk is utilized to the best advantage, while the cheese product is materially improved by the addition of the whole goat's milk.

VETERINARY MEDICINE.

An introduction to the study of infection and immunity, C. E. SIMON (*Philadelphia and New York*, 1913, 2. ed., rev. and enl., pp. X+17-325, pls. 11, figs. 18).—This book, which is in its second edition, has chapters on serum therapy, vaccine therapy, chemotherapy, and serum diagnosis, and is meant for students and practitioners. It deals especially with infection in man.

Experimental production of agglutinins in animals by injecting salvarsan, J. NICOLAS, P. COURMONT, and GATÉ (*Compt. Rend. Soc. Biol. [Paris]*, 73 (1912), No. 28, pp. 245, 246; *abs. in Centbl. Bakt. [etc.]*, 1. Abt., Ref. 56 (1913), No. 7, p. 206).—In normal animals (dogs, and especially goats) a marked increase in the agglutination titer for tubercle bacilli and typhoid bacilli is produced as a result of injecting salvarsan. Agglutination is not increased in the guinea pig or rabbit.

Investigations in regard to the toxicity of fungi; their hemolytic power, J. PARISOT and VERNIER (*Compt. Rend. Acad. Sci. [Paris]*, 155 (1912), No. 14, pp. 620-623; *abs. in Chem. Ztg.*, 36 (1912), No. 151, p. 1472).—The hemolytic power of *Amanita phalloides* in vivo and vitro is very intense. It took less than 10 drops of an extract made from the fungus and injected intravenously to kill a young rabbit within a few seconds. Fungi which are not hemolytic while young acquire the hemolytic power when they grow older. Extracts not hemolytic at the outset will hemolyze after standing for 12 hours. Heating a hemolytic extract over an open fire for about 5 minutes destroys its hemolyzing power. The hemolyzing properties of this fungus probably depend to a great extent upon the presence of a glucosid.

Mode of union between the *Amanita hemolysin* and its antihemolysin, W. W. FORD and ETHEL M. ROCKWOOD (*Jour. Pharmacol. and Expt. Ther.*, 4 (1913), No. 3, pp. 235-239, figs. 2).—"If a fresh extract of *A. phalloides* be made, filtered through a Berkefeld filter, rendered isotonic by the addition of NaCl, the hemolytic strength of this solution can be determined with great exactness and correspondingly the exact quantity of the antihemolytic serum which will neutralize it, that is, produce a mixture which will have no solvent action on blood corpuscles. If now, increasing quantities of the hemolysin be employed and the amount of antihemolysin necessary for neutralization be determined, the increase in the antihemolysin can be found. By plating the data obtained by means of a system of abscissas and ordinates the manner in which the hemolysin and antihemolysin combine can be represented in a graphic way, and exact information obtained as to the law which holds for the union of the two. A similar series of observations starting with fixed quantities of antihemolysin and estimating the amount of hemolysin neutralized can also be made and in turn platted. We thus obtain 2 lines or curves showing the combining power of the hemolysin and antihemolysin."

The mode of union is of the simplest and follows the law of multiple proportions.

Note on the *Amanita* toxin, W. W. FORD and EDITH BRONSON (*Jour. Pharmacol. and Expt. Ther.*, 4 (1913), No. 3, pp. 241-243).—*Amanita* toxin was submitted to combustion analysis. For this purpose 200 gm. of the thoroughly dried fungus was extracted with alcohol and the poison was isolated by Schlesinger and Ford's method. "At every step in the procedure the various products were tested to determine their activity. The final solution had a high degree of toxicity, 1 cc. containing 0.0007 gm. of material killing a guinea pig weighing 175 gm. in 7 hours. This solution was then evaporated to dryness on a water bath, taken up in water and precipitated in absolute alcohol, in which reagent the purified toxin is practically insoluble. This last precipitate was dried in a vacuum desiccator.

"From the 200 gm. of fungus we obtained 0.2114 gm. of a slightly pigmented amorphous powder which represents the active principle and retained its toxicity unimpaired. This substance has failed to crystallize under any conditions which we have thus far been able to produce. Its amorphous character renders investigations into its chemical nature extremely difficult and the results of combustion analysis are necessarily of doubtful value."

The final product was of a high degree of toxicity. Its ash consisted of 9.5 per cent of sodium salts. The combustion analysis showed it to contain nitrogen and sulphur in large quantities and hydrogen and carbon.

"The hemolysin and the toxin differ radically, not only in their physiological properties but in their chemical reactions, and require different methods of preparation. The hemolysin, for instance, is precipitated by 65 per cent alcohol and by basic lead acetate, while the toxin is soluble in alcohol of this strength and is not thrown down by lead acetate. Many other chemical differences are to be noted. In spite, however, of the dissimilar methods of preparation the 2 final products, in both cases physiologically active, contain nitrogen and sulphur in addition to the elements carbon, hydrogen, and oxygen."

Action of extracts made from the mushroom (*Agaricus campestris*), boletus (*Boletus edulis*), and chanterelle (*Cantarellus cibarius*) upon the red blood corpuscles, E. FRIEDBERGER and G. A. BROSSA (*Ztschr. Immunitätsf. u. Expt. Ther.*, 1, Orig., 15 (1912), No. 6, pp. 506-517).—This consists of an investigation in regard to the presence of agglutinins and hemolysins in the extracts of the above-named fungi. Toward the blood corpuscles of various animals, i. e., guinea pig, pig, rabbit, sheep, horse, and bovine, certain differences in

regard to the agglutination were noted. For instance, no agglutination was found with the bovine corpuscles and *A. campestris* extract, and the rabbit corpuscles were agglutinated the strongest.

Somewhat different was the behavior in the case of the *B. edulis* extracts, which agglutinated strongly at first, but was later followed by hemolysis of the cells. In some cases, after 2 hours hemolysis again set in. No agglutination was noted with the corpuscles of the guinea pig and sheep, and the greatest amount of agglutination was with rabbit corpuscles. The hemolysis was greatest with the horse corpuscles. Agglutination, in contrast to the results obtained with the mushroom, was present for bovine corpuscles.

With the chanterelle extracts no effect in regard to agglutination or hemolysis was noted with the corpuscles of the pig, horse, and sheep. Hemolysis was present only for guinea pig corpuscles. The hemolysin of *A. campestris* was found to withstand a temperature of 80° C. for 15 minutes, while a temperature of 95°, when exposed for the same length of time, completely destroyed the hemolysin. Heating the *B. edulis* extract for one-half hour at 60° preserved its agglutinating function but destroyed its hemolytic properties.

Horse and sheep sera were found to inhibit the action of a boletus extract upon homologous blood corpuscles. Rabbit serum had no inhibitory effect upon the agglutination. The strong inhibiting power of bovine blood serum is removed when, instead of the homologous blood, pig blood is used. On the other hand, pig serum acts more inhibitory toward bovine blood corpuscles than toward homologous blood corpuscles.

In order to determine whether the active principle present in the extracts is utilized during the agglutination process, tests were made with decreasing doses of mushroom extract and rabbit blood corpuscles, which were changed twice during the process. It was found that the agglutinating property for the rabbit corpuscles was entirely removed. The process is considered specific.

Note in regard to the precipitating serum for the protein of *Agaricus muscarius*, B. GALLI-VALERIO and M. BORNAND (*Ztschr. Immunitätsf. u. Expt. Ther.*, I, Orig., 17 (1913), No. 2, pp. 180-185).—Specific precipitins for the *A. muscarius* could be reproduced by immunizing rabbits with the protein (albumin) of the fungus. With it, it is possible to detect the presence of 1 part of *A. muscarius* in a mixture with 7 parts of *Boletus edulis*.

Among the fungi used for comparative purposes in the tests were *A. iridium*, *A. campestris*, *A. nudum*, *Cantarellus cibarius*, *B. edulis*, *Helianthus repandum*, *Morchella esculenta*, and *Tuber cibarium*.

This reaction may eventually be of great value in detecting the presence of poisonous fungi among edible mushrooms, and also for the purpose of detecting adulterations in these goods with inferior material.

Cicuta, or water hemlock, C. D. MARSH, A. B. CLAWSON, and H. MARSH (*U. S. Dept. Agr. Bul.* 69 (1914), pp. 27, pls. 4, fig. 1).—The plants of the genus *Cicuta* are of especial interest since they are probably the most violently toxic of all the plants growing in temperate regions. The poisonous principle is not in the aromatic oil which exudes when the rootstock is cut open but in a resin, this having been separated under the name cicutoxin.

The authors present a historical summary, a brief description of the genus *Cicuta*, distinguishing between *Cicuta* and *Conium*, and mention the popular names, localities where *Cicuta* poisoning has occurred, losses of live stock from *Cicuta* poisoning in the United States, and uses of *Cicuta*. Experimental work in Colorado, a report of which follows, is taken up under the headings of feeding experiments with sheep and with cattle in 1910 and experimental work in 1911. Under the heading of general conclusions are discussed the symptoms of *Cicuta* poisoning, autopsy findings, toxic dose, animals poisoned by *Cicuta*,

water poisoned by *Cicuta* roots, the part of the plant which is poisonous, season when most poisonous, and remedies for *Cicuta* poisoning.

It is shown that the poisonous properties of *Cicuta* have been recognized since the middle of the seventeenth century and that a large number of cases of poisoning of man and animals have been reported. The toxic principle is probably common to all species and there is reason to think that all species are equally poisonous. There is a definite train of symptoms, marked by nausea, pain, and violent convulsions, which makes it easy to diagnose cases of *Cicuta* poisoning. The prominent lesions, as found in autopsies, are congestion of the lungs, kidneys, and central nervous system, with inflammation of the alimentary canal. So far as known all the higher animals are poisoned by *Cicuta*. The quantity necessary to poison is very variable, depending probably on the stage of growth, although the plant is very poisonous at all times. The toxic principle is largely confined to the rootstock. The tops under ordinary circumstances are not poisonous and neither the tops nor seeds when found in hay are a source of danger. An emetic is said to be the best remedy, there being very little that can be done for poisoned live stock.

A bibliography of the literature cited, consisting of 51 titles, is appended.

The influence of the subcutaneous mallein test upon the diagnostic blood examination in glanders, *Ä. MARCIS* (*Berlin. Tierärztl. Wchnschr.*, 29 (1913), No. 35, pp. 621-624, figs. 2).—After the subcutaneous administration of mallein there are produced in the blood of nonglandered animals specific precipitins, agglutinins, and complement-fixing amboceptors. These are the same as occur in glandered horses. The precipitins are present the third day after the injection. The agglutinins come after 5 to 7 days, and the complement-fixing amboceptors 6 to 10 days post injection. The various antibodies disappear in the same order. Most of the antibodies present in animals treated with mallein begin to disappear the second or third week after the mallein injection, and after 3 months they are totally absent; consequently 3 months must elapse after the mallein injection before correct results can be obtained with the blood tests.

The effect of cold upon the larvæ of *Trichinella spiralis*, *B. H. RANSOM* (*Science, n. ser.*, 39 (1914), No. 996, pp. 181-183).—The author reports the results of a single series of experiments which show that cold has a lethal action upon *Trichinella* larvæ. In the experimental work most of the parasites survived when exposed for 6 days to a temperature ranging between 11 and 15° F., but when exposed to a temperature of about 0° F. the larvæ quickly succumbed, only one of more than 1,000 larvæ examined having survived the 6 days' exposure to this temperature. The single trichina which survived was one of 275 isolated from a piece of trichinous meat which had been kept at a temperature of about 0° F. from September 27 to 30, then allowed to thaw, and again kept at the same low temperature from October 1 to 4, or a total of 6 days' exposure. "None was found alive among 498 larvæ from a piece of trichinous meat kept at about 0° F. September 27 to 30, allowed to thaw, then exposed again to the same low temperature October 1 to 3, and thus exposed 5 days in all, nor was any found alive among 233 larvæ from a piece of trichinous meat kept continuously at about 0° F. for 5 days. Out of 301 larvæ from trichinous meat kept at about 0° F. for 3 days only 5 showed signs of life. Two hundred and twenty-five out of 366 larvæ exposed for 2 days to a temperature of about 0° F. were dead, and many of the remaining 141 showed only faint signs of life. Results similar to the above were obtained from tests of trichinosed meat on guinea pigs."

The results of these experiments suggest the possibility of substituting refrigeration for microscopic inspection as a prophylactic measure.

Trypanosoma americanum, F. M. JOHNS (*New Orleans Med. and Surg. Jour.*, 66 (1914), No. 7, pp. 533, 534; *abs. in Amer. Jour. Trop. Diseases and Prev. Med.*, 1 (1914), No. 8, p. 594).—This paper reports upon a biological study made of this nonpathogenic parasite of cattle.

Contribution to a study in regard to the relation of human tuberculosis to bovine tuberculosis, D. G. IZCARRA (*Off. Internat. Hyg. Pub. [Paris], Bul. Mens.*, 5 (1913), No. 8, pp. 1337-1343).—Following a review of the literature in regard to the relation of bovine tuberculosis to tuberculosis in man, some feeding tests with guinea pigs are reported. In some instances the animals received the meat of tubercular animals and in other cases the meat juice.

Only the meat of animals affected with miliary or acute generalized tuberculosis produced tuberculosis in the guinea pigs; localized cases did not. The statistics relating to the occurrence of bovine and human tuberculosis in Spain are discussed.

Guinea pigs were also fed raw milk obtained from the open market. The six which received the milk as purchased remained sound, while the six which were given the lower portion of the centrifuged milk became tuberculous. In another group of guinea pigs in which the milks were administered by the intraperitoneal route, only two of the six receiving the milk as purchased became tuberculous, whereas of the six which received the lower portion of the centrifuged milk four became tuberculous. A third group of animals received hypodermic injections of the milks. Only one of the six receiving the milk as purchased became tubercular, whereas two out of the six given the lower centrifuged portion became diseased. The statistics in Spain relating to the causation of tuberculosis by the consumption of milk from tuberculous cows are also discussed.

About atypical tuberculosis in slaughtered animals, HAFEMANN and BINDER (*Ztschr. Fleisch u. Milchhyg.*, 23 (1912), No. 6, pp. 124-131, figs. 2; 23 (1913), No. 7, pp. 153-156, fig. 1; *abs. in Centbl. Bakt. [etc.]*, 1. Abt., Ref., 56 (1913), No. 20, p. 620).—Tests made with 4 calves, 1 adult bovine, and a pig brought out the fact that in the lymphatic glands undergoing rayed caseation, as first described by Bongert, tubercle bacilli are often present. In the lymphatic glands accompanying this rayed caseation there occur peculiar, macroscopically visible changes which are seldom observed in tuberculous pigs. The changes are observed most often in the periphery of the cell, but also appear on the walls of the gland in the cut preparation, or they may appear a little inwardly as a light gray wreath containing small punctate bodies. When such lymph glands are observed, the presence of tuberculosis is rarely suspected by the inspector, but it is not a difficult matter to detect the tubercle bacilli in these glands with the antiformin method. This atypical form of tuberculosis has some characteristics which are similar to those atypical cases which have been described in man by Liebermeister.

[About atypical tuberculosis in slaughtered animals], HAFEMANN and BINDER (*Ztschr. Fleisch u. Milchhyg.*, 23 (1913), No. 23, pp. 531, 532).—A continuation of the work noted above. It is pointed out that the pathologic condition is noted but seldom in the lymphatic glands of the cow's udder. The histological findings showed a connective tissue proliferation. Investigations were conducted for the purpose of determining the cause of this connective tissue proliferation. In the literature of human medicine similar findings are recorded.

The authors noted the presence of tubercle bacilli in seven cases and the conclusion is reached that the process is of a tuberculous nature. It is, however, pointed out that virulent tubercle bacilli are seldom present in the lymphatic glands of either pigs or cows which show the pathologic changes under discussion.

The intradermal test for tuberculosis in cattle and hogs, C. M. HARING and R. M. BELL (*California Sta. Bul.* 243 (1914), pp. 93-154, figs. 20).—Some of the material reported in this bulletin has been noted from another source (E. S. R., 29, p. 499). "In all, 4,926 intradermal tests have been made on 4,001 cattle, 1,614 of which reacted, and there has been an opportunity to check these results by autopsies in 341 cases and by the discovery of lesions on physical examination in 54 additional cases. To 291 cattle that reacted to the intradermal test the subcutaneous test was subsequently or simultaneously applied, and 282 cattle reacted. Forty-four cattle with a positive intradermal reaction gave no thermal reaction to the subcutaneous test."

It was possible to bring to autopsy only 10 of the cattle which failed to react to the subcutaneous method, but in 9 of these tuberculous lesions were noted. Thirty-five of the cattle which failed to react to the intradermal test later reacted to the subcutaneous test. "Two of these cows which reacted to the subcutaneous method, but showed no swelling at the point of intradermal injection, were found on autopsy to be tuberculous."

The cattle which reacted to the intradermal test and manifested a local swelling usually showed a thermal reaction which resembled that produced by the ordinary subcutaneous injection. When an intradermal injection was given a few days after a subcutaneous injection, the results obtained were not reliable. "The thermal reaction which accompanies the intradermal injection usually subsides in 20 hours, but it seems desirable not to apply the subcutaneous test for several days after the intradermal. The longer the interval the better."

While the results with Koch's tuberculin in 10 per cent solutions and with alcoholic precipitated tuberculin in 0.5 per cent solutions compared favorably in accuracy with the usual subcutaneous method, a more satisfactory method seemed to be to give one-fifth cc. of a 5 to 50 per cent solution of an alcoholic precipitated tuberculin in the subcaudal fold and to administer 2 cc. of Koch's old tuberculin (10 per cent) subcutaneously. "With this kind and strength of tuberculin the local reactions are pronounced and the thermal reactions are as characteristic as those that occur from subcutaneous injections alone."

The application of strong disinfectants at the site of injection is to be avoided.

The intradermal reaction is much harder to interpret than either the ophthalmic or the subcutaneous test inasmuch as a great deal of experience is necessary to interpret the significance of the local swelling. This is especially true when glycerin is present in the tuberculin. "When 5 per cent solutions of potent precipitated tuberculin are used both the ophthalmic and intradermal methods equal the subcutaneous test in accuracy, but we have found that the ophthalmic method is unsuitable for use in routine testing under California conditions, except when the cattle can be kept indoors. The intradermal method has proved very satisfactory in the out-of-door tuberculin testing frequently necessary in this State, and for the nonofficial testing of large numbers of cattle is preferable to the subcutaneous method. . . . By administering the ophthalmic, intradermal, and subcutaneous tests simultaneously, a higher percentage of tuberculous cattle will be detected than if dependence is placed on one test alone.

The intradermal test was also found very valuable for detecting tuberculosis in hogs. A dose of one-fifth cc. of 10 per cent precipitated tuberculin was used and with it tuberculous hogs often showed a thermal as well as a local reaction. No decision was reached as to the best site for making the injection. The larger swellings, however, were noted when the injection was made at the edge of the ear. For measuring the swelling a special form of caliper is described and illustrated.

The bulletin is well illustrated with cuts showing the method of applying the test and the results obtained after giving tuberculin. The protocols of autopsies and the work of other authors are included, with a bibliography of 57 titles.

Texas or tick fever, J. R. MOHLER (*U. S. Dept. Agr., Farmers' Bul. 569* (1914), pp. 24, figs. 5).—This is a revision of and supersedes Farmers' Bulletin 258, previously noted (*E. S. R.*, 18, p. 181).

Actinomycosis of the mammary gland in dairy herds in Victoria, E. A. KENDALL (*Vet. Jour.*, 70 (1914), No. 465, pp. 132-148).—A paper read before the Australasian Association for the Advancement of Science, at Melbourne.

A bovine disease caused by the *Bacillus necrophorus*, M. BALOGH (*Állatorrosi Lapok*, 36 (1913), No. 35, pp. 415-417; *abs. in Vet. Rec.*, 26 (1914), No. 1333, p. 470).—*B. necrophorus* was found present in the ulcers of an affection, observed for several years in cattle in Hungary, which had hitherto been regarded as an atypical form of bovine malignant catarrhal fever.

Care of the teeth in dairy cattle, D. CULLEN (*Breeder's Gaz.*, 65 (1914), No. 1684, p. 522).—The author reports that on examination of 500 cows he found diseased or irregular teeth in 371, or over 60 per cent; of these 47 had one or more teeth diseased, 19 had one or more teeth absent, and 31 had one or more points of enamel protruding through the mucous membrane of the cheeks.

Strongylus capillaris of the camel, A. PRICOLO (*Centbl. Bakt. [etc.]*, 1. Abt., *Orig.*, 71 (1913), No. 2-3, pp. 201, 202).—*S. capillaris*, here described as new, is a habitual parasite in the small intestine of dromedaries in Tripoli, often being associated with hemorrhage, hyperemia, and catarrh of the intestinal mucosa.

A study of epithelioma contagiosum of the common fowl, C. D. SWEET (*Univ. Cal. Pubs., Zool.*, 11 (1913), No. 3, pp. 29-51).—"Epithelioma contagiosum is a specific infectious disease. The virus is constantly present in material from the lesions found on the head and on the buccal mucous membranes, and in the blood of infected fowls. The disease is readily and constantly produced by inoculation with material from the lesion or with the blood from infected fowls. This inoculation is not the transplantation of tumor cells from one fowl to another, as the virus is present in the filtrate after passage through a Berkefeld filter, and so far as we are able to discover neoplasms have not been produced by inoculation with such filtered extract, with the exception in one case of a sarcoma of the fowl transmissible by an agent separable from the tumor cells as described by Rous (1911) [*E. S. R.*, 25, p. 90].

"The period of incubation varies from 3 to 12 days, depending on the virulence of the virus and on the method of inoculation. The virulence of the virus is lowered by age and by the action of chemicals. Within limits the virulence of the virus increases with passage through a fowl. An immunity is produced, which is complete within a definite time, is specific, and of considerable duration. The tissue reaction at the point of inoculation is very similar to that produced by inoculation with known infectious agents. There is a definite relation between the resistance of the host and the virulence of the infection, i. e., an inoculation with a virus of reduced virulence produces a reaction that is entirely local, while a more virulent strain produces a reaction that is not limited to the point of ingress. In response to an inoculation with epithelioma contagiosum there is produced a specific antibody in the blood of the host.

"Epithelioma contagiosum and roup are entirely independent diseases. Epithelioma contagiosum is constantly and readily transmitted by inoculation, while roup is not (Ward). Immunity conferred by an inoculation with the

virus of epithelioma contagiosum does not prevent the contraction of roup. Under the conditions of our experiment, epithelioma contagiosum was not fatal to mature fowls, while all that contracted roup died. The cell inclusions present in the hyperplastic epithelial cells of epithelioma contagiosum show changes which may perhaps represent stages in the development of a protozoan parasite, but we are unable so to connect them that a complete life cycle is definitely established."

A bibliography of 26 titles is appended.

RURAL ENGINEERING.

Frictional resistance in artificial waterways, V. M. CONE, R. E. TRIMBLE, and P. S. JONES (*Colorado Sta. Bul. 194 (1914), pp. 48, figs. 41*).—A series of field experiments in cooperation with this Office with metallic, reinforced concrete, and timber flumes, concrete lined and earth canals, concrete and timber chutes, and inverted siphons of wood-stave pipe are reported which were conducted to determine (1) the coefficient of roughness in empirical formulas for the several types of open channels; (2) whether such coefficient changes with variations of discharge; and (3) the loss of head in water flowing through siphons, to compare Kutter's formula with the ordinary friction formula as adapted to pressure pipes, and to compare the accuracy of different methods of making current meter measurements.

The average values found for the coefficient of friction n in Kutter's formula for the several types of open channel were as follows: (1) Semicircular metallic flumes, smooth water face, wasteways less than 100 ft. long, 0.021; smooth water face, 0.011; joint connections protruding into the waterway, 0.0174; corrugations at right angles to the line of flow, 0.0225. (2) Timber flumes, lined with patent roofing material, 0.016; planed lumber, battens on the sides, flooring placed transversely, 0.015; planed lumber, battens on the sides, flooring placed longitudinally, 0.012; planed lumber, no battens, perfect alignment, 0.011. (3) Concrete-lined channels, smooth concrete or mortar-finished surface, 0.012; surface unplastered as left by forms, 0.016; bed exceptionally smooth, fine silt, uniform cross-section, straight alignment, 0.017; bed of hard, water-worn adobe, 0.022; bed of coarse gravel and small loose stones, 0.024; banks, smooth clay; bottom, fine sand; grass hanging into water, 0.027; bed, hard, water-worn adobe, many fine roots projecting, 0.028; bed, fine silt, merging into clay, many large, loose stones, 0.030; bed, little gravel, mainly smooth, rounded stones, 0.032.

The following table gives the hydraulic elements as found for wood-stave siphons:

Hydraulic elements of wood-stave siphons.

Diameter.	Length of pipe	Maximum pressure head.	Discharge.	Mean velocity.	Total loss of head.	(c) ¹	(n) ²	(f) ³
<i>In.</i>	<i>Feet.</i>	<i>Feet.</i>	<i>Second-feet.</i>	<i>Ft. per sec.</i>	<i>Feet.</i>			
48.....	486	51	20.34	1.62	0.497	49.4	0.0271	0.1005
48.....	515	66	20.44	1.63	.202	82.2	.0172	.0380
36.....	815	-----	15.25	2.16	.515	98.6	.0140	.0262
60.....	363	37	49.70	2.53	.669	52.8	.0275	.0925
60.....	1,621	99	49.70	2.53	1.045	89.7	.0169	.0324
60.....	426	55	50.73	2.58	.506	61.8	.0238	.0675
60.....	323	26	53.99	2.75	.368	72.7	.0204	.0486
60.....	405	59	53.99	2.75	.408	77.6	.0193	.0429
58.....	2,278	104	52.68	2.88	1.162	116.0	.0134	.0192
54.....	544	83	52.68	3.31	.942	75.0	.0195	.0458
54.....	2,563	60	53.99	3.39	2.205	109.1	.0139	.0220
54.....	803	77	53.99	3.39	1.438	75.6	.0193	.0449

¹ Value of (c) in Chezy formula $V=c\sqrt{rs}$.

² Value of (n) in Kutter's formula.

³ Value of (f) in formula for lost head due to friction and curvature, $h=f\frac{L}{d}\frac{V^2}{2g}$

Discharges varied in the inverse ratio as the coefficient of roughness, the hydraulic radius and slope remaining constant.

The vertical velocity curves for the timber flumes are flatter than those for the earth sections and approach more nearly a vertical position. "In general . . . the amount of distortion of the vertical curves from a vertical line varies directly as the roughness of the bed."

It is concluded as regards current meter measurements: (1) The multiple point method gives the closest determination of the actual mean velocity and should be used where accuracy is more essential than time, and where the conditions of flow are constant. (2) The vertical integration method is applicable where reasonable accuracy is desired in a comparatively short time. (3) The 0.2 and 0.8 method is more rapid than either of the previous ones, but should not be used in very narrow or very shallow channels. (4) Actual experience has shown that the assumption upon which the 0.6 method is based is not true in all cases. "With either the 0.2 and 0.8 or the 0.6 method approximate results will probably be obtained, the degree of accuracy varying with the cross-sectional factor and the roughness of the material."

A comparison of formulas for estimating run-off, J. W. CUNNINGHAM (*Engin. and Contract.*, 40 (1913), No. 25, pp. 690, 691, fig. 1).—For the purpose of comparison the author gives the algebraic statements of a number of formulas for run-off, with results platted from conditions existing in southern Wisconsin. The extreme variation in results leads to the conclusion that the use of formulas for run-off is dangerous, unless such formulas are well founded on a thorough study of local data and conditions.

Irrigation experiments at the experimental farm of the Royal Imperial College of Agriculture at Gross Enzersdorf (Austria) (*Zentbl. Landw.*, 93 (1913), No. 9, pp. 101-112; *abs. in Internat. Inst. Agr. [Rome]*, *Mo. Bul. Agr. Intel. and Plant Diseases*, 4 (1913), No. 8, pp. 1191, 1192).—Three years' flooding irrigation experiments were conducted on 2.47 acres of a 10-acre field of 4-year-old alfalfa. The irrigation water was supplied by centrifugal pumps from underground sources. The test plat was divided into 10 plats, 1 remaining un-irrigated, 3 receiving about 148,000 cu. ft. of water, 3 others receiving 258,000 cu. ft. of water during the vegetative period, and the last 3 being irrigated only in the autumn. All the plats were manured alike.

On the unirrigated plat a close relation was found between temperature and the time of harvest, and also between the rainfall and the amount of crop. This plat yielded 3 crops with 28 cwt. of dry substance per acre. Only the first crop was satisfactory, the others being poor and unreliable. Four crops were obtained from the irrigated plats, the average results being as follows: Plats irrigated during the vegetative period with 148,000 cu. ft. of water produced 4 tons, those with 258,000 cu. ft. 3 tons, and those which were irrigated only in the autumn $3\frac{1}{2}$ tons of dry matter per acre.

Irrigation experiments with brackish water, O. BORDIGA (*Abs. in Internat. Inst. Agr. [Rome]*, *Mo. Bul. Agr. Intel. and Plant Diseases*, 4 (1913), No. 8, pp. 1192-1194).—To determine the possibility of utilizing brackish water for irrigation on a large scale a series of pot experiments was conducted using water of different degrees of salinity. Detailed analyses of the soil show that it was clayey and had good mechanical structure and chemical composition.

In the experiments, cotton, chicory, maize, and tomatoes were planted in zinc vessels, each containing from 180 to 185 lbs. of soil, and manured by the addition of 12 gm. of bicalcic phosphate and the same amount of ammonium sulphate. The cotton and chicory died, but the other two crops were each watered with different solutions as follows: Pure water; water containing 0.7389 per cent of salts as chlorids and carbonates; and water containing $\frac{1}{4}$, $\frac{1}{2}$,

and $\frac{3}{4}$ of this amount of salts. The plants were watered when they appeared to need it, and received every time sufficient to form a stratum from 1.2 to 3.6 cm. deep, the total amount received being 36.6 cm. by the maize, and 33.6 cm. by the tomatoes.

During the vegetative period the maize appeared to suffer from the salts, especially when they were present in the larger quantities, while the tomatoes seemed in no wise affected. The yield of maize decreased with an increase of salts. In the case of the tomatoes, the maximum weight of plant was obtained with the least salt, but the weight of fruit obtained with the maximum amount of salt was greater than that obtained with the smaller doses, though smaller than when fresh water alone was used. It is noted that maize irrigated with fresh water yielded within 4 months at the rate of 50 cwt. of dry matter per acre, and when irrigated with brackish water the yield was a little less than half. Tomatoes with fresh water yielded at the rate of 18.3 cwt. of dried stems and leaves per acre and 121 cwt. of fruit per acre, while with brackish water the weight of the dried stems and leaves was 20.3 cwt. and that of the fruit 111.5 cwt.

Federal v. private irrigation, D. C. HENNY (*Engin. News*, 71 (1914), No. 3, pp. 120-124).—From a comparison between the cost of private and government irrigation, and an analysis of factors affecting this, the conclusion is drawn that the cost of irrigation is far more dependent upon local conditions than upon the agency through which it is effected. The author presents and compares results as to settlement, points out the need of public funds for future irrigation development, discusses various features of the Reclamation Act, and indicates changes in the law which he thinks are desirable.

State rivers and water supply commission (*Victoria Rivers and Water Supply Com. Ann. Rpt.*, 8 (1913), pp. 37).—This is a report and statement for the financial year 1912-13 regarding the water supply, irrigation, drainage, water measurement, and flood protection. Marked progress in the extent and practice of irrigation is noted.

Measuring devices [irrigation], B. A. ETCHEVERRY (*Jour. Electricity*, 31 (1913), Nos. 3, pp. 68-70, fig. 1; 4, pp. 90, 91, fig. 1).—This article describes the use of rating flumes, weirs, a weir box and take-out from pipe line under pressure, a miners' inch board or box, and submerged orifices for the measurement of irrigation water.

Pumping and other machinery, A. A. MUSTO (*Dept. Agr. Bombay Leaflet* 8 (1912), pp. 19, pl. 1, fig. 1).—This pamphlet presents the main features to be considered in developing pumping projects, and describes the procedure usually followed by the agricultural engineers of the department.

Designing water conduits of large diameter, A. C. JANNI (*Engin. News*, 71 (1914), No. 2, pp. 66-68, figs. 6).—It is stated that "in a horizontal pipe containing water the internal pressure is much less at the top than at the bottom, and the stresses in a circular element are not purely tensile, but comprise a tension and a bending moment" which in large pipes or conduits becomes determinative. On this basis the author analyzes the design of large water conduits, giving formulas for covered conduits based on Guidi's method, and computing moment diagrams for a covered conduit on two assumptions as to vertical reaction and a stress diagram for bottom sections.

A bibliography of foreign works on the subject is appended.

Farm drainage, C. F. BROWN (*Utah Sta. Bul.* 123 (1913), pp. 5-56, figs. 14).—This bulletin is intended as a practical treatise, supplementing the series of co-operative investigations and practical field demonstrations between the Utah Station and the Drainage Investigations of this Office. It emphasizes the

general need for drainage in arid regions with reference to seepage and alkali problems, and is intended to cover "all engineering phases of farm drainage from the general observations concerning specific needs of drainage to the realizations of successful reclamation."

The road problem, J. H. A. MACDONALD (*Rpt. Brit. Assoc. Adv. Sci., 1912, pp. 373-383*).—The author discusses the past, present, and future of road construction, particularly pointing out the marked disadvantages resulting from road rolling, such as the formation of transverse ridges and furrows, the formation of potholes where road metal is mixed with mud and rolled, and the tendency to use too large stones. He draws attention to the enormous increase in motor traffic and concludes that present and future construction, particularly of the road crust, must in consequence be adapted to the traffic.

Mechanical engineering aspects of road construction, R. E. CROMPTON (*Surveyor, 45 (1914), No. 1146, pp. 4-10, figs. 6*).—The opinion is expressed that the development of road locomotion must be jointly studied by vehicle designers and road engineers. A brief review of the development of self-propelled vehicles and a description of the waving of road crusts and the conditions which cause and accentuate them are followed by the author's views as to the methods of road crust construction to prevent or minimize such action. It is pointed out that there is a great tendency for modern motor vehicles of the heavier classes to have nearly the same percussive and rebounding effects, and that the frequent passage of such traffic along a road tends to produce a regular wave formation of equal wave lengths. Initial waving is said to be produced in the process of rolling, and the use of a special three-axle roller is advocated.

In conclusion it is shown in tabular form the extent to which the present running costs of vehicles may be reduced by a well considered reconstruction of road surfaces.

Construction of bitumen bound broken stone roads, J. W. SMITH (*Good Roads, n. ser., 6 (1913), No. 10, pp. 99-110*).—In a paper before the Third International Road Congress, London, it is concluded that by the use of tarry, bituminous, or asphaltic binders a number of different forms of road crust may be obtained which may be employed with advantage according to the various conditions of the road as regards traffic, locality, and climate. For this purpose it is suggested that a uniform system of tests, measurements, and records be drawn up, including physical and local conditions, materials employed, method of construction, traffic census, climatic conditions, periodical measurement of wear, and actual cost of the road crust as regards construction and maintenance. Other related subjects are discussed in detail.

Agricultural surveying laboratory manual, D. SCOATES (*Agricultural College, Miss., 1913, pp. 33*).—This manual, intended for the student of agricultural surveying, deals with the principal basic problems of the subject, giving assignments with instructions as to procedure, noting the necessary equipment, and including a set of sample notes for each problem.

Variations in results of sieving with standard cement sieves, R. J. WIG and J. C. PEARSON (*U. S. Dept. Com., Bur. Standards Technol. Paper 29 (1913), pp. 16, fig. 1*).—A number of tests to determine what order of discrepancy may be expected in fineness determinations of cement by the standard routine method of sieving included investigations on differences in the standard sieves, the so-called "personal equation" of the observer, lack of uniformity in samples, and residual errors.

It is concluded that both sieving tests and the interpretation of measurements on sieves are subject to considerable discrepancies, that errors due to "personal equation" are appreciable in hand sieving, and that the rating of a sieve by

some system of demerits assigned from direct measurements is worthy of further study.

"The sieve at best is a measure of the coarseness of finely ground material rather than the fineness, and experiments now in progress . . . indicate that air separation will offer a more satisfactory means of determining fineness than mechanical sieving." It is further concluded that a tolerance of 1 per cent from the specification should be allowed with the No. 200 sieve and 0.5 per cent with the No. 100 sieve, every care being taken to conduct the test in strict accordance with standard methods.

French tests on oil-mixed concrete, R. FERET (*Ann. Ponts et Chaussées*, 9. ser., 17 (1913), pt. 1, No. 5, pp. 413-436, pl. 1; *abs. in Engin. News*, 70 (1913), No. 25, pp. 1228, 1229).—A series of French tests on the effect of mixing a heavy mineral oil with a concrete on the density and water repelling qualities leads to the conclusion that it is much simpler and cheaper to obtain a maximum density of mortar by a judicious choice of sand and by carefully proportioning the mix than by the addition of a water-proofing agent.

Effect of hydrated lime on Portland-cement mortars, H. S. SPACKMAN (*Engin. Rec.*, 69 (1914), No. 1, pp. 25, 26, figs. 9).—Investigations of the effect on the physical characteristics of the hardened mortar of the addition of hydrated lime to Portland cement to increase the plasticity and impermeability are reported with curves of results.

It is concluded from these tests that the addition of hydrated lime to cement mortars is to be recommended on the grounds that, in addition to making the mortar more plastic and impermeable, its use will probably result in a reduction in tendency of the mortars to shrink and crack, greater durability, and probably an increase in strength beyond that needed in the laboratory tests, as the greater plasticity will permit of better work being done by artisans.

Cement pipes and distributing stand pipes, B. A. ETCHEVERRY (*Jour. Electricity*, 31 (1913), No. 10, pp. 216-219, figs. 7).—This article describes and illustrates the underground cement pipe system of water distribution, particularly for orchard irrigation. Information is given regarding the location and construction of the system, particularly discussing the construction and operation of the stand pipes containing the regulating valves.

Some data on reinforcing concrete pipe, C. E. SIMS (*Concrete-Cement Age*, 3 (1913), No. 5, pp. 204, 205).—Tests of the relative value of different methods of reinforcing concrete drain tile showed that single-hoop reinforcement at the wall center and longitudinal reinforcement added little to the strength of the tile. The best results were obtained with double-hoop reinforcement.

The use of the formula $M=0.075 WD$, developed in connection with the tests for computing reinforcement, is illustrated. M equals the negative bending moment at the crown, W is the weight in pounds per inch in length of tile, and D is the diameter of the tile from the wall centers.

Transverse strength of screws in wood, A. KOLBERK and M. BIRNBAUM (*Cornell Civ. Engin.*, 22 (1913), No. 2, pp. 31-41, figs. 4; *abs. in Engin. and Contract.*, 40 (1913), No. 25, pp. 694-696, figs. 4).—The results of tests to determine the strength of ordinary cut screws in single shear in cypress, yellow pine, and oak joints are reported, and the following conclusions are drawn:

In cypress, the effect of boring holes for the screws is to weaken slightly the joints, while the opposite is true in yellow pine. Friction between adjoining pieces plays only a small part in the strength of the joint. Decreasing the number of screws per joint increases slightly the strength per screw. To secure the best results in a wooden joint, the outer piece should be about 0.4 the length of screw. For a particular gage, equal penetration into the middle piece

will give equal transverse strength, regardless of the thickness of the side piece, provided it supplies sufficient bearing area. The transverse strength per screw in yellow pine or oak varies directly as the square root of the penetration into the middle piece, while in cypress it varies directly as the cube root of the penetration in the middle piece.

For a particular length of screw the smaller the gage the greater the strength per pound of screws. As the length of screw is increased the strength per pound is decreased, the gage remaining constant. As the number of screws per pound is increased the strength per pound is increased, irrespective of length or gage: the strength of a yellow pine joint is about 80 per cent, and of a cypress joint about 40 per cent of that of an oak joint. There is no apparent simple relation between gage or diameter and transverse strength. The smaller the gage the more economical the screw, the length remaining constant. The gage remaining constant, the shortest screws will be most economical.

Sun-power plant (*Sci. Amer. Sup.*, 77 (1914), No. 1985, p. 37, figs. 2).—A comparative estimate of the cost of power from coal and from solar radiation "shows that the sun-power steam generator will compete in the tropics with a coal-burning steam generating plant which can obtain its coal at a rate of only \$2.40 per ton delivered to the furnace doors. Any excess in the cost of coal burning beyond this figure is clear profit in favor of the sun-power plant."

Utilizing waste heat of a small gas engine (*Power*, 38 (1913), No. 27, pp. 922, 923, figs. 3).—This article describes and diagrammatically illustrates the utilization of the heat carried off in the exhaust and jacket water from an 8-horsepower gas engine. The exhaust heat is utilized in a drying closet, and the velocity of the exhausting gas as an exhauster for dust and dirt. The jacket-water heat supplies hot water and hot chemical mixtures.

An experimental study in multiple effect evaporation, N. DEER (Hawaiian Sugar Planters' Sta., *Agr. and Chem. Bul.* 42 (1914), pp. 47, figs. 9).—This bulletin describes methods employed and reports results of three years of experimental work in a number of mills with multiple effect evaporation under continually reduced pressure. The experimental work included investigations on such subjects as rate evaporation as influenced by the vacuum in the last cell, by higher initial temperature, and by variation of the temperature of the steam entering a cell of an evaporator and the temperature in the vapor space; heat economy of evaporators; and the evaporative capacity of quadruple-effect vertical submerged tube and horizontal tube apparatus. General results and conclusions are as follows:

"The temperature difference in the first cell is a rough index of the rate of evaporation.

"The vapors in a multiple effect evaporator are superheated.

"The calculated effect of self-evaporation in a multiple effect evaporator is never realized, due to superheating of vapors and to short-circuiting of vapors with the incondensable gases.

"Not only is the rate of evaporation influenced by the gross temperature difference, but it is also affected by the absolute temperature prevailing, increasing as this increases.

"Increase of the gross temperature difference by means of decreasing the temperature at the cold end up to the temperature corresponding to a vacuum of 27 in. gives a material and valuable increase in the rate of evaporation, but this increase is not by any means as great as is obtained by a similar increase in gross temperature difference obtained at the hot end by increasing the temperature (or pressure) of the steam.

"The heat economy of quadruple effect evaporators as found in practice compared with a computation on ideal lines lay between 0.8 and 0.9. This latter figure was found with well protected and the former with unprotected or badly protected apparatus.

"A vertical submerged tube apparatus with 5 lbs. gage pressure in cell 1 (227° F.) and not less than 26.5-in. vacuum in last cell (127° F.) should evaporate not less than 9 lbs. water per square foot per hour, with juice entering at 212° F. and should evaporate 4.2 lbs. water per pound of steam. If these conditions are not realized foul heating surfaces, too slow evacuation of condensed waters or incondensable gases, may be looked for.

"A horizontal tube film evaporator had a much greater rate of evaporation than vertical submerged tube evaporators."

The heat balance of a cane-sugar factory, N. DEERR (*Hawaiian Sugar Planters' Sta., Agr. and Chem. Bul. 43 (1914), pp. 21*).—Investigations on the heat value of bagasse and the steam generated by its combustion, the steam required in evaporation in single and multiple effect, and the heat represented by work, are reported. The mean heating value of bagasse is taken as 8,100 B. T. U. per pound of dry bagasse, and the actual heat of combustion is taken as the basis of calculation of the efficiency of bagasse as a fuel.

Comparative tests of a water tube boiler and smoke tube tandem boilers showed that on the average the smoke tube boilers evaporated 2,815, and the water tube boilers 2,328 lbs. of water per pound of bagasse from and at 212° F. "This gives a superiority in so far as regards steam per pound of fuel of 20 per cent; this increased economy is to be attributed solely to the much greater proportion of heating surface per pound of fuel burnt. . . .

"The efficiency of combustion as evidenced by the percentage of CO₂ in the flue gases is very much the same and the superiority in economy found with the tandem boiler is simply due to the greater reduction in the temperature of the products of combustion due to the larger heating surface."

A comparison of the relative efficiencies of heating surfaces as regards heat transmission showed the water tube boiler to be 1.15 times as efficient as the fire tube boiler.

It is concluded that capital expended in ample heating surface in the cane sugar industry will always be a profitable investment and that multiple crushed bagasse is equal in fuel value to bagasse not so treated. Further data are given showing the heat used by an entire plant. Heat balances constructed on the basis of such data for two factories of high and average efficiency show that under such circumstances the second factory might operate without extra fuel while the first would have a great surplus for other uses.

It is concluded "that the heat balance of a cane sugar factory will depend on a multitude of factors so that an analysis is required of each individual factory. The factors without the control of the factory executive are: (1) Fiber in cane, controlling the steam available; (2) sugar in cane, controlling the amount of evaporation to be done at single effect and at multiple effect. The factor under the control of the factory executive is efficiency of the factory, including therein heating surface in boilers and control of the combustion, protection of hot surfaces, sufficient heating surface in evaporators to obtain not less than 65° Brix in sirup, and arrangement of plant to allow of the use of extra steam and of multiple heating."

Central station power for farmers, D. R. PALMQUIST (*Sci. Amer.*, 109 (1913), No. 22, pp. 405, 417, figs. 3).—This article gives "specific data and information" as to the cost on farms of using electric power from central stations.

Ruralizing electricity, J. E. DAVIDSON (*Jour. Electricity*, 31 (1913), No. 16, pp. 339-344, figs. 4).—This article deals with the more important uses of electricity in rural districts, principally under conditions encountered in the Northwestern States and from the viewpoint of the central station manager.

Harvesting ice with central-station energy (*Elect. World*, 63 (1914), No. 2, p. 96, figs. 3).—The successful use of central-station electrical energy at 8 cts. per kilowatt hour for ice harvesting in place of a portable engine and boiler is reported. The equipment consisted of an induction motor, countershaft, transformers, meter, and switch. In making the application the engine connecting rod was unbolted from the crank shaft and the flywheel was belted directly to the motor-driven countershaft on the truck, the rest of the hoisting mechanism remaining unchanged.

Farm machinery laboratory manual, D. SCOATES (*Agricultural College, Miss.*, 1913, pp. 48).—This manual contains a list of exercises for the student of farm machinery. These consist of examining the different farm machines with regard to manufacture, construction, and operation.

Agricultural machines and implements, J. HAGMANN (*Jahresber. Landw.* 27 (1912), pp. 466-505, figs. 29).—This article describes and illustrates a number of what are considered the more recent and efficient developments in agricultural implements and machinery, including power plows, tractors, harrows, manure spreaders, drags, drills, cultivating machinery, mechanical irrigation plants, hay and grain mowers and harvesters, threshing machinery, presses, grain sorters, cleaners and dryers, grinding mills, dairy apparatus, power apparatus, small belt driven machines, and lubricators.

Solving the fuel problem for the motor truck, H. W. SLAUSON (*Sci. Amer. Sup.*, 76 (1913), No. 1975, pp. 292-294, figs. 5).—The author deals with the characteristics of kerosene as a fuel for internal combustion engines, and describes and illustrates several devices for carbureting kerosene fuel, especially in motor truck engines.

Some experiments with steam threshing machinery at Cawnpore, B. C. BURT (*Agr. Jour. India*, 8 (1913), No. 4, pp. 347-354, pl. 1).—Experiments with animal and internal combustion power for threshing are said to have been unsatisfactory, while by the use of a small portable steam engine fairly good results were obtained. The inexperience of the labor force appeared to be the greatest handicap in all the experiments, but it is believed that steam threshing is now a practical proposition in that locality.

Farm building construction, L. J. SMITH (*Canad. Thresherman and Farmer*, 18 (1913), Nos. 1, pp. 10, 64, figs. 2; 2, pp. 66, 69, 70, figs. 4; 4, pp. 80, 82, 83, figs. 5; 5, pp. 22, 24, 62, figs. 5).—This article presents both by drawings and popular discussion the principles of construction of the various types of farm buildings, with particular reference to their adaptability to the conditions of the Northwest. The principal subjects dealt with are locating and laying out buildings, building foundations, stone walls, framing, and roofs.

[**Farm building, planning, and construction**] (*Illus. Landw. Ztg.*, 33 (1913), No. 87, pp. 779-792, figs. 46).—Special articles contained in this periodical dealing with agricultural buildings are as follows: *Agricultural Building Construction*, by D. Schucht (pp. 779, 780); *Building Material*, by R. Preuss (pp. 780, 783), which discusses the use of brick, stone, cement, and wood in the construction of agricultural buildings; *Newer Plans for Farm Buildings*, by E. Kühn (pp. 783-785), which describes and gives diagrammatic illustrations of more recent developments in German farm building construction; *New Swabian Farm Houses*, by C. Friz (pp. 785, 786); *Farmyard Arrangement*, by Thaler (pp. 786, 787); *Sanitary Stall Construction*, by P. Sieck (pp. 787-789), which gives descriptions and diagrammatic illustrations of recent developments in

German stock barns; *Economical Buildings*, by F. JUMMERSPACH (pp. 789, 790), which gives plans and sections of buildings; and *Laborers' Dwellings*, by F. WAGNER (pp. 790-792), which describes, illustrates, and gives plans and brief specifications for dwellings fitted for farm laborers.

Cheaply constructed tanks, L. K. WARD (*Jour. Dept. Agr. So. Aust.*, 17 (1913), No. 4, pp. 453-455, figs. 4).—Small cement and rubble and mud-lined tanks are diagrammatically illustrated and their construction briefly described.

The construction of dipping tanks for cattle (*Rhodesia Agr. Jour.*, 11 (1913), No. 2, pp. 196-206, pls. 3).—Detailed plans, specifications, and suggestions to "serve as a model of general applicability" in the construction of dipping tanks are given, followed by hints on dipping.

Modern practice in heating and ventilation, X, XII, A. G. KING (*Dom. Engin.*, 65 (1913), No. 11, pp. 341-343, figs. 7; 66 (1914), No. 1, pp. 6-8, figs. 4).—The first of these articles describes and gives suggestions for the actual installation of the single main or one-pipe system of hot water heating with diagrammatic illustrations. The second gives information regarding forced circulation of hot water in domestic heating systems, and describes lay-out methods and methods of figuring connections.

Sizes of pipe for gravity hot water [heating] systems, M. S. COOLEY (*Dom. Engin.*, 66 (1914), No. 1, pp. 2-5, fig. 1).—This article gives a chart for determining the proper sizes of piping for a hot water heating system and describes the method by which it was devised and its practical application, including formulas for use under various conditions.

Good and bad plumbing installations (*Dom. Engin.*, 66 (1914), No. 2, pp. 30-32, figs. 12).—Up-to-date household sanitary fittings are described and illustrated, and good and poor methods of installation discussed.

RURAL ECONOMICS.

Rural versus urban: Their conflict and its causes, J. W. BOOKWALTER (*New York*, 1911, pp. VIII+292).—The author maintains that through lack of coordination in the growth and expansion of agriculture and other industries in the United States there has been a wide disparity in the distribution of the total created wealth between the rural and urban population. It is claimed that if the Government, by a judicious distribution of public lands, had maintained a proper coordination there would yet remain a large and untouched domain of fertile lands which would guarantee peaceful thrift and industry throughout the nation.

The church and the rural community, W. H. WILSON (*Amer. Jour. Sociol.*, 16 (1911), No. 5, pp. 668-693).—According to the author there have been three phases of economic experiences in the development of American agriculture, the pioneer, the exploiter, and the husbandman. Each has had its influence on the country church.

As a few striking exceptions to this general statement, he mentions the Pennsylvania Dutch and Quaker communities. These have been an economic success from their establishment, have eliminated pauperism, and maintained their social organizations.

The reason given for the decadence of most of the country churches is the wastefulness in the past of the American rural and ecclesiastical economy. In the future, he believes that the church must recognize that religion is the result not only of personal but of social experience. A number of successful rural churches are cited and it is maintained that success depends upon church unity and the economic prosperity of the farmer. The ministry of the country church should be trained with these two facts in mind.

The rural housing question, T. B. PHILLIPS (*Jour. Roy. Soc. Arts*, 62 (1914), No. 3197, pp. 324-335, figs. 4).—The housing problem in England arises from two factors, a slight increase in agricultural population and a marked increase in the number of persons working in towns but living in the country and in many cases taking up the houses formerly occupied by agricultural laborers. The remedies suggested are increased wages so that the agricultural laborer could pay a remunerative rent, cheapening the cost of living, and state aid. The first is considered the best means of improvement.

England's foundation: Agriculture and the State, J. S. MILLS (*London*, 1911, pp. V+93).—The author discusses the changes that were predicted would follow by a repeal of the Corn Laws, the decline in agricultural production, and the influence of these two factors upon the social and physical welfare of the people and the available food supply in time of war. Among his conclusions are the following: The first duty and function of any social community is to be able to feed its members. A State or nation that has to buy its food from outside its borders must always have a far lower security for its welfare and independent existence than an organization which is self-sufficient in the elements of life.

How shall farmers organize? W. R. CAMP (*North Carolina Sta. Bul.* 225 (1914), pp. 3-17).—This bulletin discusses the methods that may be used to get people together to incorporate a cooperative association and to petition for a certificate of incorporation, outlines the by-laws for a cooperative purchase and sales society, shows the difference between a cooperative society and the ordinary business corporation, and gives lists of the publications relating to farm credit, marketing, and business organization and of farmers' organizations in North Carolina.

Report of the agricultural credit commission of the Province of Saskatchewan, 1913 (*Regina: Govt.*, 1913, pp. 224+III, pl. 1).—This report outlines the methods used in European countries in supplying agricultural credit, describes the agricultural and economic conditions in the Province, and gives recommendations for solving the agricultural credit situation. Among the recommendations are that the liability of the members of local credit associations be limited to an amount not more than 50 per cent greater than the amount of their loans, all mortgage loans to be issued on the amortization basis to cover a period of not less than 15 nor more than 35 years, the rate of interest be limited to the cost to the association of the money itself and the necessary running expenses, loans be limited to 40 per cent of the value of the property to be mortgaged, and that an association shall consist of at least 10 members with a combined mortgage loan of at least \$5,000, the local associations to be united into a central association known as the Saskatchewan Cooperative Farm Mortgage Association.

Report of the work of mutual agricultural credit banks and the results obtained in 1912, RAYNAUD (*Bul. Mens. Off. Renseig. Agr.* [Paris], 13 (1914), No. 1, pp. 11-17).—This report gives for the 98 regional banks that received advances from the State the amount of advances granted and repayments made for 1912 by geographic divisions, and for France as a whole the operation of the regional and local banks and cooperative societies for the transformation and sale of agricultural products for 1911-12.

The garden to table express, C. C. MILLER (*Business America*, 15 (1914), No. 2, pp. 160-163).—The author discusses the marketing conditions in New York City and the proposed municipal wholesale markets. The new market system will have a market in each borough, located if possible on a water front so as to have both water and railroad connections. It will have a daily auction

sale to fix prices and a daily bulletin showing the quantity and prices of supplies in the market.

The drift to the city in relation to the rural problem, J. M. GILLETTE (*Amer. Jour. Sociol.*, 16 (1911), No. 5, pp. 645-667).—The author concludes that the increase in rural population is in reverse and that in urban population is in direct proportion to the degree of industrialization. He considers that the increase in urban population is due primarily to immigration, that migration from rural districts is of secondary importance, and that the birth rate is approximately the same in the urban as in the rural districts. Although the birth rate for those of the same nativity is higher in rural districts than in urban, the preponderance of foreigners in cities tends to equalize the rate.

The most serious effect of migration from rural communities is the loss of leadership. The author would check this cityward movement by improving the home and social conditions and reorganizing the rural schools.

The movement of rural population in Illinois, H. E. HOAGLAND (*Jour. Polit. Econ.*, 20 (1912), No. 9, pp. 913-927).—According to the author the poverty of rural social life has not been the cause of rural depopulation, since the regions with a decrease in population are not found to be the ones where the farmer's life is duller or more monotonous than those in which the rural population has increased. The exodus from rural communities has been fully as active since the introduction of rural free delivery, the telephone, and better roads as before. The increased use of machinery, increase in the relative number of horses, and in saving of time by use of the telephone and by improving the roads have done much toward increasing the efficiency of the farmers so that it takes less of them to produce a given quantity. These same factors have influenced the changes in the small rural villages or towns since they have made the larger town more accessible and have taken away the necessity of frequent trips to the village.

The migration of people within France and from foreign countries and between the urban and rural districts, É. PAYEN (*Écon. Franç.*, 42 (1914), I, No. 7, pp. 227-229).—This article calls attention to the fact that the number of foreigners in France has increased from 106 per 10,000 inhabitants in 1851 to 286 in 1911. It also shows that the rural population has decreased from 26,650,446 in 1846 to 22,093,318 in 1911, while the urban population has increased from 8,751,315 in 1846 to 17,508,940 in 1911. Attention is called to the localities with the more marked changes.

["World" increase in population and agricultural production], N. C. MURRAY (*Amer. Econ. Rev.*, 3 (1913), No. 1, Sup., pp. 29-31).—The author points out that the population of the civilized world, excluding China, has been increasing at a rate slightly more than 1 per cent a year, the production of wheat, corn, oats, and barley more than 2 per cent a year, of potatoes more than 3 per cent, and of sugar nearly 4 per cent. The supply of animal products has also kept pace with the population. Although there has been a decline in the exports of agricultural products from the United States, the quantity remaining for home consumption has increased faster than the population.

Index number as expressing the fluctuation of agricultural production in France, E. GAIN (*Rev. Gén. Sci.*, 25 (1914), No. 2, pp. 47-49).—The author, by dividing the difference between the maximum and minimum by the average, obtains the index number of the fluctuation in cultivated area, total production, total value and value per quintal, and average yield per hectare for the principal crops for 1901-1910. He gives similar index numbers for the fluctuation in the monthly prices for a number of crops and of meat for 1891-1910. This article is devoted to a description of his method and the results obtained.

Statistics of prices (*Viertelj. Statist. Deut. Reichs*, 22 (1913), No. 3, pp. 44-55).—This report gives the monthly prices for meat animals and the weekly prices for rye and wheat at the principal large markets of Germany for 1908-1912.

Acreage, harvest, and manufacture of tobacco in Germany (*Viertelj. Statist. Deut. Reichs*, 22 (1913), No. 3, pp. 109-125).—Data are given for 1912 showing by Provinces the number of planters, area planted, amount harvested and value, number of manufacturing establishments, and other data relating to the manufacture of tobacco.

Agricultural statistics of Austria for 1912 (*Statist. Jahrb. K. K. Ackerb. Min.* [Vienna], 1912, pp. IV+300).—This is the annual report of the Minister of Agriculture, and gives data showing the area cultivated, in meadow, in garden, and in pasture, and the production, average yield, and prices for all farm crops for 1912 by minor geographic divisions.

Yearly statement regarding dairying in Austria for 1911 (*Jahresber. Stand Milchw.* [Austria], 1911, pp. 270).—This report gives by minor subdivisions the kind of establishments, membership, milk received, butter and cheese made, and other data regarding dairying in Austria.

Russia, D. M. WALLACE (*London, Paris, New York, and Melbourne*, 1905, vols. 1, pp. XVI+456, pls. 2; 2, pp. XII+487, pl. 1).—The author of these volumes gives a vivid and detailed description of conditions in Russia. Among the chapters are the following that relate to agriculture: The peasantry of the North; the mir, or village community; the pastoral tribes of the steppe; landed proprietors of the old school; the emancipation of the serfs; and the emancipated peasantry.

Agricultural statistics of Roumania (*Min. Agr., Statist. Agr. Românici*, 1913, pt. 1, pp. 8).—This is the annual statement giving the area devoted to cereal, fiber, leguminous, and industrial plants, gardens, forage, and vineyards for the crop year 1912-13 by geographic divisions, and comparative data for Roumania as a whole for 1908-1913.

Agriculture in Hausa Land, northern Nigeria, P. H. LAMB (*Bul. Imp. Inst.* [So. Kensington], 11 (1913), No. 4, pp. 626-634).—This article describes the methods of cultivation, the natural fertility of the soil, and the possibilities of future development of the agriculture.

[Agriculture in Japan], Y. TAKENOB and K. KAWAKAMI (*Japan Year Book*, 1913, pp. 155-177).—This chapter of the yearbook is devoted to the various economic factors in agriculture, such as arable land, farming population, increase of productive power, condition of tenant farmers, animal labor, farmers' debts, irrigation and drainage, area, production, and trade in staple farm products, sericulture, stock farming, poultry, and dairy and meat preserving.

Season and crop report of Bengal for the year 1912-13, J. R. BLACKWOOD (*Dept. Agr. Bengal, Season and Crop Rpt. 1912-13*, pp. 46).—This report gives statistical data, showing by districts the rainfall, classification of agricultural lands, area under crop, yield per acre of the principal farm crops expressed in percentage of the normal yield, harvest prices, and number of live stock.

Variations in Indian price levels (*Calcutta: Com. Intel. Dept.*, 1913, pp. 16, pls. 5).—Index numbers are shown for the prices of the principal vegetable and animal foods, sugar, tea, coffee, textiles, hides, and tallow for 1861-1912.

Farm management (*Amer. Econ. Rev.*, 3 (1913), No. 1, Sup., pp. 96-113).—This article consists of a round table discussion of the various phases of farm management by H. C. Taylor, T. N. Carver, C. K. Graham, J. A. Valentine, R. Hittinger, W. H. Bowker, and W. O. Hedrick. The principal phases emphasized are farm accounting, the use of machinery and hand labor, and the relationship of the various factors in agricultural production.

AGRICULTURAL EDUCATION.

Agricultural education and its relation to rural sociology, A. F. Woods (*Amer. Jour. Sociol.*, 17 (1912), No. 5, pp. 659-668).—The author discusses the rural school, holding that "faulty education and educational methods are among the more fundamental of the limiting factors to proper social development;" economic conditions, which necessitate the development of better community life in rural districts generally; and educational methods, including as most effective the movable schools, short courses, institutes, the farmers' club, the grange and other similar organizations, and local demonstration farms. The work of the last-named "has been carried out with skill and the results have been clear, but the educational effect produced has been as a rule unsatisfactory." The average man who came to view the demonstration farm, while fully impressed with the importance of the work, went away with the feeling that it was something beyond his capabilities." Hence, less attention has been given to state demonstration farms and more to directing the individual farmer in reorganizing his own farm. He is shown how cooperative marketing adds greatly to the profits. This leads to cooperative buying and other cooperative efforts.

State and national aid in the improvement of public roads, drainage, the dissemination of agricultural information, and the improvement of the school system, especially along industrial lines, is regarded as a great stimulus to improvement in many rural communities. A brief survey is given of the results of state aid for instruction in agriculture in the high schools of Minnesota. The author emphasizes the cooperation of all educational agencies, both state and national, as a means of accomplishing a socialization of country life according to the best American ideals.

Sequence of science and agriculture in the high school, J. MAIN (*School Sci. and Math.*, 13 (1913), No. 8, pp. 695-700).—In this consideration of the problem of what the high school sciences shall be, the order in which they shall be given, and how they shall be affected by the introduction of industrial subjects such as agriculture, the author thinks that the final analysis of accurate gradation and sequence of all rational school subjects will probably be found to conform to muscular development. In agriculture all the subjects involve the use of both large and small muscles. Subjects demanding more use of the finer muscles come later in the course than those involving more use of the coarser. Those requiring skill and accuracy of the larger muscles may often have an early or late treatment or both. He suggests a sequence of agricultural subjects according to this test of motor adjustment.

A course in the natural history of the farm, J. G. NEEDHAM (*Nature-Study Rev.*, 9 (1913), No. 6, pp. 170-174, fig. 1).—In view of a lack of appreciation in his students of any relation between their previous nature work and the studies in pure science which occupy chiefly the earlier years of their college course, the author began in the spring of 1913 the preparation of a course on the natural history of the farm which he gave in the fall to a class of 400 freshmen then entering the New York State College of Agriculture. It consisted of one lecture and one field trip a week and proved very satisfactory. The field work is described.

Field work records, J. G. NEEDHAM (*Nature-Study Rev.*, 9 (1913), No. 7, pp. 203-207).—The author requires 4 different sorts of field work records according to the nature of the work involved, viz, drawings and structural diagrams, maps, tables, and annotated lists, each of which is briefly described. He points out that a record of field work facilitates the accumulation and com-

parison of data, concentrates attention on specific points, gives purpose to observation, and insures results.

College work in plant pathology, F. H. BLODGETT (*Plant World*, 16 (1913), No. 11, pp. 304-314).—In this discussion of college work in plant pathology the author concludes that such work may be given advantageously as a part of the regular work in horticulture, when it would naturally be the concluding course of the group taken and occupy a part or all of the senior year. The subject matter should be so chosen as to show the most serious diseases of important crop plants with due consideration for as wide a range of types of parasitic fungi as practicable. The student on graduation should be able to give actual help in his community in recognizing and controlling the common diseases of crops.

Suggestions for the development of higher horticultural institutions [in Germany], K. HEICKE (*Möllers Deut. Gärt. Ztg.*, 28 (1913), No. 43, pp. 511-513).—The author discusses a suggested reorganization of the higher horticultural institutions in Germany, viz, at Dahlem, Geisenheim, and Proskau, whereby each institution would specialize in one of the principal branches of horticulture instead of competing with each other in covering the whole field of horticulture as at present. Each institution would still provide a preliminary course in the fundamentals of horticulture so that students could readily change from one institution to another for specialization.

The Wurttemberg Cheese School and Experiment Station (*Die Württembergische Käseerei-Versuchs- und Lehranstalt zu Wangen im Allgäu. Bergedorf* [1913], pp. 35, figs. 17).—An account of the equipment, arrangement, and work of the Wurttemberg Cheese School and Experiment Station.

The modern English farmer's wife, MARY L. MOORE (*Breeder's Gaz.*, 64 (1913), No. 25, pp. 1239, 1242c, figs. 2).—In addition to describing the general conditions of farm life from the woman's standpoint, mention is made of the rapid growth of educational work in home economics and the great importance of this movement to the housekeeper.

A course in general science for high schools, to be used as an introduction to agriculture, domestic science, and other science courses, W. L. EIKENBERRY (*School Sci. and Math.*, 14 (1914), No. 2, pp. 186, 188).—An outline is given of a course in general science as an introduction to agriculture, domestic science, and other science courses arranged under the following principal topics: The air and our relation to it, water and its uses, work and energy, the earth's crust, and life on the earth.

One year's course in secondary agriculture, A. W. NOLAN (*School Sci. and Math.*, 14 (1914), No. 2, pp. 143-146).—The author gives a detailed outline of a secondary course in agriculture comprising studies of matured plants, animals, farm business and life, machinery, soils, and conditions of plant growth.

The leaf-portfolio as an aid in tree study, ANNA B. COMSTOCK (*Nature-Study Rev.*, 9 (1913), No. 7, pp. 197-202, figs. 4).—The author describes several ways of making leaf portfolios, in any of which it is essential that accuracy be observed in determining the trees so as to label the leaves properly, and that the collection be made as complete as possible. Such a collection serves to teach the pupil about the objects collected, remains as a reference to refresh the memory, and may also be beautiful as well as interesting.

School gardens in Idaho, MAMIE L. POLLARD (*Nature-Study Rev.*, 9 (1913), No. 7, pp. 207-213, figs. 4).—The school garden work at the Lewiston State Normal School is described. This is a part of the department of nature study in all grades of the training school above the first grade, unifying into a central scheme. The aims for grades 2 and 3 are to educate children in the proper use of garden tools, to keep the garden weedless and well cultivated,

and to identify readily the seeds and plants of 4 or 5 common vegetables; for grades 4, 5, and 6 to ascertain the value of manual dexterity and the money saving effected by owning a garden; and for grades 7 and 8 to note the reasons for various processes. Grades 4 to 8, inclusive, have individual gardens. The problem of summer care of gardens is solved by the summer school continuing until August 1 and having a man in charge thereafter until the autumn session.

The North Dakota pork production contest, V. STEPHENS (*Farmer*, 32 (1914), No. 8, p. 271, figs. 3).—An account is given of a competition entered into by 300 farm boys and girls between the ages of 10 and 18, to secure the largest production of pork at the lowest feed cost a pound in the shortest period of time. The contest extended from March 10 to November 20 and was under the direction of the Better Farming Association. The 20 prizes consisted of \$340 offered by live stock commission firms, pure-bred hogs by individuals interested in hog raising, and several tool chests by a hardware firm. The 16-year-old winner of the first prize made a profit of \$91.06 on his litter of 14 pigs in 203 days with pork at 6 cts. a pound, producing 2,903 lbs. pork at a feed cost of 2.8 cents a pound. The second prize was won by a 12-year-old girl who sold her litter of 8 pigs a month after the close of the contest for 7 cts. a pound, and produced 2,098 pounds of pork in 218 days at a feed cost of 1.7 cents a pound.

MISCELLANEOUS.

Annual Report of Hawaii Station, 1913 (*Hawaii Sta. Rpt. 1913*, pp. 53, pls. 3).—This contains the organization list, a summary by the special agent in charge as to the investigations of the year, and reports of the entomologist, horticulturist, assistant horticulturist, chemist (including analyses of lava), agronomist, assistant agronomist, and superintendent of the substations. The experimental work recorded is for the most part abstracted elsewhere in this issue.

Twenty-sixth Annual Report of Louisiana Stations, 1913 (*Louisiana Stas. Rpt. 1913*, pp. 54).—This contains the organization list, a report by the director discussing the functions and work of the stations, an account of their progress, including brief departmental reports, and a financial statement as to the federal funds for the fiscal year ended June 30, 1913, and as to the state funds for the fiscal year ended November 30, 1913.

Twenty-sixth Annual Report of New York Cornell Station, 1913 (*New York Cornell Sta. Rpt. 1913*, pp. CXLIII+954, pls. 48, figs. 212).—This contains the organization list, reports of the director of the station and heads of departments, a financial statement as to the federal funds for the fiscal year ended June 30, 1913, and as to the state funds for the fiscal year ended September 30, 1913, and reprints of Bulletins 321-333, Memoirs 1 and 2, and Circulars 13-20, all of which have been previously noted, and of Bulletins 334 and 335 abstracted elsewhere in this issue.

Director's report for 1913, W. H. JORDAN (*New York State Sta. Bul. 372* (1913), pp. 549-574).—This contains the organization list and a review of the work and publications of the station during the year.

Proceedings of the fourth general assembly (*Inst. Internat. Agr. [Rome], Actes 4. Assemblée Gén., 1913*, pp. VII+574).—This volume contains the reports to the general assembly of the International Institute of Agriculture concerning statistics of agriculture, live stock, and commerce, plant diseases, adulteration of seeds, agricultural meteorology, protection of birds, statistics of fertilizers, dry farming, farm accounts, statistics of cooperation, and insurance against hail. See also a previous note (E. S. R., 29, p. 1).

NOTES.

California University.—The university granted about 900 degrees at its recent commencement. A number of summer expeditions of agricultural students have been arranged to study soils, agronomy, citriculture, animal industry, etc. About 80 agricultural clubs have been organized in high schools by the extension division assisted by the agricultural club of the college of agriculture. Seven counties have now organized farm bureaus for conducting extension work.

Connecticut Stations.—The stations are planning a corn survey of the State, the idea being to ascertain what varieties are being raised with the best results in different sections, to compare these varieties by growing them in the northern and southern sections, and to inaugurate the work of improvement by selection. It is thought possible that a portion of this work may be entrusted to certain farmers who will grow seed for sale in the State.

Oregon College and Station.—Beginning with the ensuing academic year, the entrance requirements for the degree courses will be so increased as to render eligible only students who have taken three years of high school work and have a minimum of 12 credit units. The following year a further increase to 4 years of high school work or its equivalent will be made. It is expected that candidates who have not had these advantages will be enabled to qualify through the newly established vocational courses. These courses will extend over one year, providing work in agriculture, domestic science, and farm shop work.

Eleven counties of the State are now cooperating in the county demonstration work. Particular attention is being given to such phases as the introduction of clover crops and alfalfa for fertility maintenance, the building of silos, combating fire blight, and the testing of dairy herds through associations of dairymen.

V. I. Safro, research assistant in entomology in the station, has resigned to take effect July 1.

Pennsylvania College.—A rest room in the local national bank is being fitted up for use by farmers. A member of the senior class of the college is providing a series of charts for use in the room.

Porto Rico Federal Station.—C. N. Ageton, assistant chemist, has resigned to accept a position as chemist for the Central Experiment Station in Cuba.

Clemson College.—An allotment of \$300 has been made by the trustees for a study of the limestone and marl deposits of the State and their value for agricultural purposes. The work will be in charge of F. H. H. Calhoun, professor of geology and mineralogy.

Tennessee University and Station.—The East Tennessee Farmers' Convention held its forty-first annual meeting on the station farm May 19-21 with an attendance of approximately 2,500.

An agricultural train is to be fitted up to traverse the State during July, August, and September.

The following changes in the station staff occurred March 1. E. C. Cotton, assistant entomologist, resigned to carry on a commercial orchard in Ohio. G. M. Bentley, assistant zoologist and entomologist, has been appointed entomologist, and H. R. Watts, assistant entomologist.

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NOTE.—The abbreviations "Ala. College," "Conn. State," "Mass.," etc., after entries refer to the publications of the respective experiment stations; "Alaska," "Guam," "Hawaii," and "P.R." to those of the experiment stations in Alaska, Guam, Hawaii, and Porto Rico; "Can." to those of the experiment stations in Canada; and "U.S.D.A." to those of this Department.

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U. S. DEPARTMENT OF AGRICULTURE
OFFICE OF EXPERIMENT STATIONS
A. C. TRUE, DIRECTOR

Vol. XXX

JUNE, 1914

No. 8

EXPERIMENT STATION RECORD



WASHINGTON
GOVERNMENT PRINTING OFFICE
1914

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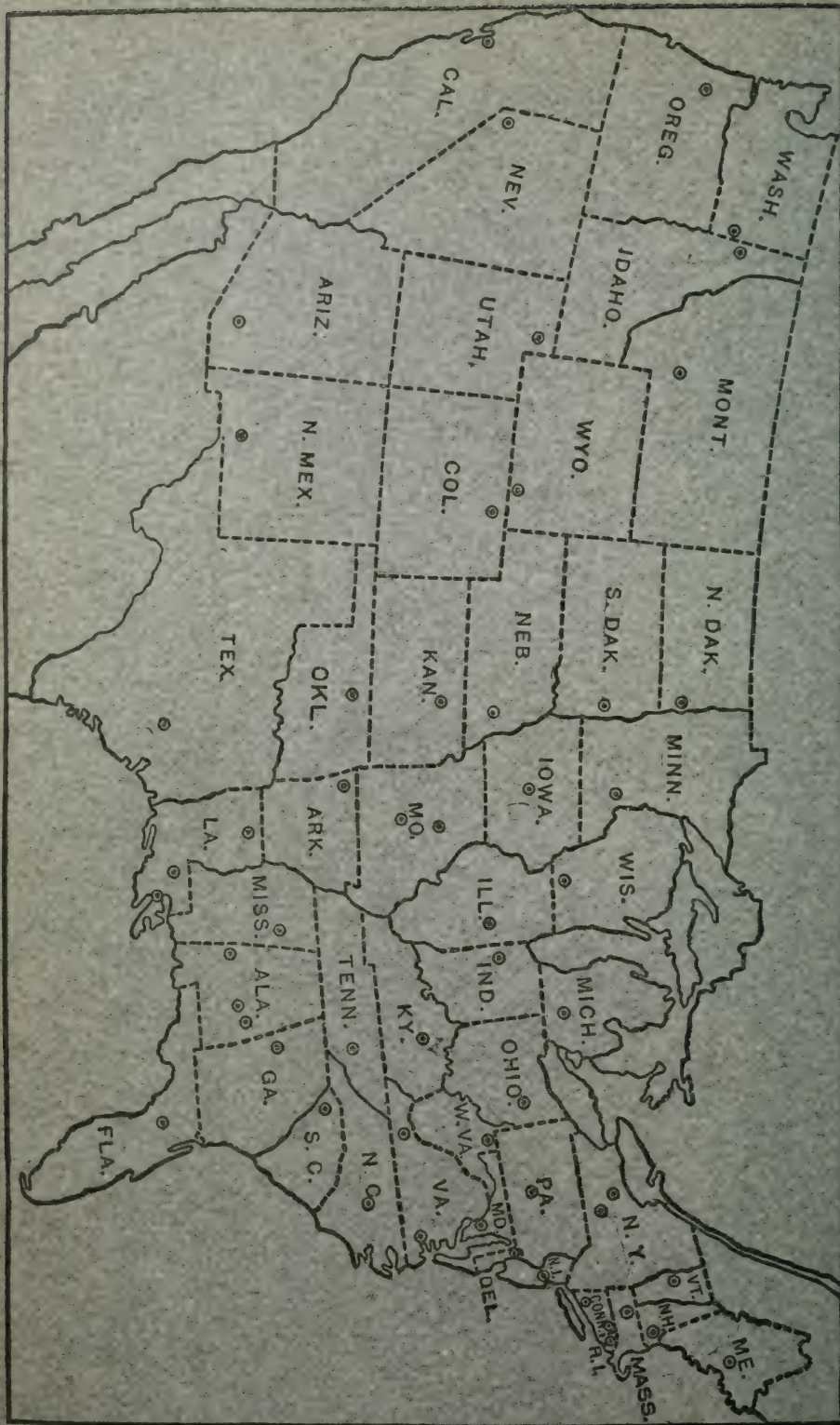
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